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A Delicate Balance...

How to Capitalize on Data Storage Capacity While Maximizing Effectiveness & Ease of Use

Moore's Law, named after Intel co-founder Gordon Moore, is alive and well and living inside your computer. Moore predicted more than 45 years ago that the number of transistors on a computer chip would double about every two years, and, so far, this has proved correct. The result has been increasingly powerful and efficient computers, providing more functionality at a significantly lower cost.

As computers become more powerful and efficient, researchers can design scientific activities that generate increasingly large data sets and exploit this computer power to analyze the data, leading to an amount of high-quality information never before thought possible. That's good, right? Well, yes ... and no. Massive quantities of data being generated present complex data storage and stewardship issues for universities, libraries, industrial giants and governments worldwide.

"Our capacity for storing data offers great promise, but the challenge is in making it useful," says CASE member Leslie M. Loew, professor of cell biology and computer science and engineering and director of the R. D. Berlin Center for Cell Analysis and Modeling at the University of Connecticut Health Center.



At the Center for European Nuclear Research (CERN), massive banks of computers manage data from the center's Large Hadron Collider (LHC). Physicists in Yale's Relativistic Heavy Ion Group expect to process up to 2 Petabytes of LHC data each year from their participation in the ALICE (A Large Ion Collider Experiment) Collaboration, which last month collected its first LHC data from lead-ion collisions at an energy of 2.76 TeV per nucleon pair. [Photo: Serge Bellegarde, CERN]

Among the challenges: How can essential, sometimes irreplaceable, data be best preserved and organized for future use? Who owns the data? Who pays for the computing hardware necessary to store and analyze large data files? Who may access the files? How can researchers ensure that their work will be accessible in the future when computing technology becomes obsolete so quickly?

These questions and more are being addressed in conversations at seminars and meetings, as well as in professional journal articles and the general media. "These are difficult problems for which we presently have no solutions," said Steven M. Girvin, a member of CASE and deputy provost for science & technology and Eugene Higgins Professor of Physics and Applied Physics at Yale University.

Data Storage Solutions & Problems

An article in the August 28, 2009 *Wall Street Journal* online [<http://online.wsj.com/article/SB125139942345664387.html>] notes that "computer users worldwide generate enough digital data every 15 minutes to fill the US Library of Congress." Girvin says the amount of data being generated is "hard to imagine." He

(Data Storage, page 2)

News from the National Academies

The following is excerpted from press releases and other news reports from the National Academies (www.national-academies.org).

◆ US Competitive Edge in Science, Engineering Depends on Minority Participation

A new report from the three national academies says efforts to strengthen US science and engineering must include all Americans, especially minorities, who are the fastest growing groups of the US population but the most underrepresented in science and technology careers. Minority participation in science, technology, engineering, and mathematics (STEM) education at all levels should be an urgent national priority, says the report.

The US labor market is projected to grow faster in science and engineering than in any other sector in the coming years. However, non-US citizens, particularly those from India and China, have accounted for almost all growth in STEM doctorates awarded, and a number of science and engineering disciplines are heavily populated by international students. Underrepresented minorities—including African Americans, Hispanics, and Native Americans—comprised just over 9% of minority college-educated Americans in science and engineering occupations in 2006, the report notes. To reach a national target that 10% of all 24-year-olds hold an undergraduate degree in science or engineering disciplines, the number of underrepresented minorities with such degrees would need to quadruple or quintuple. To reach this goal, higher education institutions should create programs that provide underrepresented minority students in STEM with strong financial, academic, and social support. The report also recommends stronger programs to develop reading, mathematics skills, and creativity in preschool through third grade, and improved quality of K-12 mathematics and science education for underrepresented minorities.

(National Academies, page 7)

notes that in April 2010, Yale's Genomic Sequencing Center sequenced about 100 billion base pairs or about one human genome per day, so the school invested \$1 million to purchase a petabyte (10^{15} bytes or a million gigabytes) of digital storage dedicated to this research. "We are already feeling the pinch to buy more storage space because our newest sequencing machines are an order of magnitude faster than the machines purchased last year," Girvin reports.

Yale also has partnerships in large telescopes in Chile, Arizona and Hawaii. "They are yielding astronomy research never thought possible," Girvin said. Just one such co-op is slated to generate a terabyte (about 1,000 gigabytes) of data each night.

UConn's Loew calls accessibility the "big issue." "If I want to reproduce or reinterpret the data, how do I find the right piece of data for my needs?" he asks. "We need to be selective about what data we store and we need to think about what future researchers might want to do with it."

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According to Andrew Sherman, research scientist and high performance computing specialist at Yale, inappropriate data organization may lead to problems that he likens to the difference between a dictionary and a thesaurus. "Both contain the same list of words, but they are organized in very different ways," he said. "The one you prefer depends on whether you want definitions or synonyms." This suggests that different storage solutions may be needed for different applications. "We may well need to optimize data storage systems based in large part upon the ultimate application and what the end user values," Sherman said. "Speed, reliability, protection/security, capacity and ease of access are all valid needs that currently require different storage solutions. There is no 'one size fits all' solution at this point."

Sherman also cites the increasingly collaborative nature of science and other research activities, which puts additional stress on the current infrastructure. "If people at Yale and other universities want to share data and access it simultaneously, how do we make that happen?" he asks. "This presents real cost and infrastructure issues, including not only how and where the data are stored, but also the nature and capacity of the networks used to communicate the data, and a variety of privacy and security concerns."

The medical community is already grappling with these challenges and opportunities. The UConn Health Center developed a modeling and simulation system called "Virtual Cell," which is hosted on UConn hardware that is used by people all over the world via the Internet. "Each simulation can generate a mountain of data," Loew said. "The models are held in a central database and we provide a service for use and storage of the data. The user can keep the model private or they can make it available to a few users or to the whole world."

For medical records to be used in research, they must be deidentified for privacy reasons, and access to them is highly restricted. However, they can hold extremely valuable information in terms of research. "It could enable groundbreaking research if medical professionals around the country and world could access and mine that data," Loew said, noting that bioinformatics centers at UConn and throughout the country are exploring that issue.

Working toward future solutions

Almost two years ago, Yale established the Office of Digital Assets and Infrastructure (ODAI) to assess data stewardship issues and develop recommendations.

Meg Bellinger is director of ODAI. "The core mission of Yale University is to create, disseminate and preserve knowledge," Bellinger said. "Over the past 40 years, technology has played an increasing role in this process; offering many benefits, but also requiring time and commitment from faculty and the university's support structures. This issue affects not only scientists and engineers, but also our museums, libraries and galleries."

ODAI is committed to creating a coherent data stewardship infrastructure that focuses on digital content (data, including images, audio, video and metadata—data describing the data—from various domains). In collaboration with other campus partners, it provides a supportive technology and human network that offers shared solutions where possible, shared policies, and best practices, especially for intellectual property management, descriptive metadata, and management of digital resources through campus departments.

"Our efforts represent the reality reflected in many other research campuses," Bellinger said. "Non-centralized files and technology

(Data Storage, page 8)

IN BRIEF

Science and Engineering Notes from Around Connecticut



Biomedical Research

STEM CELLS FOR DISEASE MODELS. University of Connecticut researchers used skin cells from patients with the genetic disorders Angelman Syndrome (AS) and Prader-Willi Syndrome (PWS) to generate induced pluripotent stem (iPS) cells. Like human embryonic stem (hES) cells, iPS cells can become any cell type in the human body, including brain cells, also known as neurons. Both syndromes are characterized by brain abnormalities, so neurons were produced from the iPS cells to help understand the root causes and develop new therapies. CASE member **Marc Lalande**, professor of genetics and developmental biology and director of UConn's **Stem Cell Institute**, says the stem cells allow researchers to create in vitro models of human disease, providing vital information for treating these and other diseases.

GENOMAS PATENT FOR PHYLOGENOMICS. Hartford-based **Genomas** was awarded a patent entitled *Physiogenomic Method for Predicting Clinical Outcomes of Treatment in Patients*. **Andreas Windemuth**, chief technology officer and co-inventor in the patent, stated: "The PhysioGenomics Technology has been successfully applied to several psychiatric and diabetes drugs and to brain imaging. The technology correlates genotypes and phenotypes in patient populations to discover clinically functional variability." CASE member **Gualberto Ruano**, president of Genomas and co-inventor, said the patent significantly increases the value of Genomas' intellectual property portfolio.

ONE GENE CAN SPUR HUGE CHANGES IN BRAIN. Yale researchers describe how a single gene can regulate the production of cortical neurons, their migration to proper sites within the brain, the folding of brain tissue that marks the human cortex and even the size of the human brain compared to its primate cousins (*Nature*, online Aug. 22). Lead author **Murat Gunel**, Yale's Nixdorff-German Professor of Neurosurgery, Genetics and Neurobiology, collaborated with Turkish scientists to study two cousins from Turkey born with extremely underdeveloped cerebral cortices. The investigators used whole exome sequencing and identified mutations in both copies of the gene encoding the protein WDR62. Upon sequencing this gene in additional subjects with malformations of cerebral cortical development, the scientists identified six additional families with mutations in both copies of WDR62.

CI INVESTS IN AFFINIMARK. Connecticut Innovations, the state's quasi-public technology investment arm, invested \$850,000 in New Haven-based **Affinimark Technologies Inc.**, part of a Series A round of more than \$1 million in funding also involving **LaunchCapital**. "With these funds Affinimark plans to complete the clinical and regulatory development of Cerebrostrip™," said Affinimark Chairman **Harry H. Penner, Jr.**, "the first point-of-care diagnostic test enabling immediate identification and treatment of cerebrospinal fluid (CSF) leaks, whether caused by surgery or injury."



Business & Industry

LIFE TECHNOLOGIES TO ACQUIRE ION TORRENT. Life Technologies Corporation, a provider of innovative life science solutions, announced this summer it would acquire Guilford-based **Ion Torrent** for \$375 million in cash and stock. The sellers are enti-

pled to additional consideration of \$350 million in cash and stock upon the achievement of certain technical and time-based milestones through 2012. Formed by CASE member **Jonathan Rothberg**, Ion Torrent revolutionized DNA sequencing by enabling a direct connection between chemical and digital information through use of semiconductor technology. Life Chairman and CEO **Gregory T. Lucier** said that the company believes Ion Torrent's technology represents a profound change for the life sciences industry.

IMCORP MOVE. **IMCORP (Instrument Manufacturing Co.)** moved from a small facility at the **University of Connecticut** to a 15,000 square-foot facility in Manchester, CT. Founder and CEO **Matthew Mashikian**, a CASE member and an emeritus UConn professor, with several of his colleagues developed and patented a power cable diagnostic technology based on partial discharge location. Earlier this year, Mashikian was granted a US patent on a new cable diagnostic concept, the "Mashikian Axial Tomography" or MATscan which will allow a dissipation factor profile to be measured, at various excitation frequencies, along the length of an installed underground power cable.

CI'S PRE-SEED FUND. **Connecticut Innovations (CI)** launched a Pre-Seed Fund to support the formation of new technology companies and jobs. The Pre-Seed Fund provides direct financial assistance in the form of loans to Connecticut-based startup and early-stage technology companies. In September, \$4 million had been allocated to the fund. Companies can apply for loans of up to \$150,000, and funding may be used for a wide range of startup expenses. CI is now accepting applications under the new Pre-Seed Fund. Interested parties can find information, terms and conditions, and the application online at: www.ctinnovations.com/preseed

MARCUM CTC TECH TOP 40. **Marcum LLP** and the **Connecticut Technology Council** named the winners of the 2010 Marcum Tech Top 40, with Cheshire-based **Alexion Pharmaceuticals Inc.** topping both the overall list and the Life Sciences category, having achieved growth of 24,726 % over the past four years and a significant market presence with its drug Soliris®. The other category winners based on revenue growth include: *Advanced Manufacturing*, **RSL Fiber Systems, LLC** (East Hartford); *Energy Environmental Technologies*, **Fuel Cell Energy, LLC** (Danbury); *New Media/Internet/Telecom technology*, **HealthPlanOne, LLC** (Shelton); *Software*, **Higher One Holdings** (New Haven); *IT Services*, **Cervalis, LLC** (Shelton). View the full list at www.ct.org

CT TO RECEIVE \$13M FOR SMALL BIZ. Connecticut will receive more than \$13 million for small business lending under a new federal program that aims to expand and create jobs in the state, state officials said. The US Treasury Department is allocating the \$13.3 million to Connecticut as part of the recently passed Small Business Jobs Act. States are required to demonstrate a minimum of \$10 in new private lending for every \$1 in federal funding. Accordingly, the \$1.5 billion investment from the federal government is expected to support \$15 billion in additional private lending.

POCKET WIRELESS DEFUNCT. Not even two years after its \$80 million expansion into the state, **Pocket Wireless** ceased operations in Connecticut on Oct. 31. The provider of pay-as-you-go phones blamed the recession, the expense of new infrastructure, and increased competition from national providers for its failure to gain enough market share in Connecticut and Western Massachusetts.

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

PRACTICAL ENERGY SOLUTIONS' NEW HQ. Lighting specialist **Practical Energy Solutions** (PES) opened its new 25,000 square foot headquarters in Wallingford this fall. The company has increased its workforce four-fold in the past two years. The new building will be Energy Star and LEED Platinum certified by the US Green Building Council. Practical Energy Solutions specializes in providing sustainable energy savings to customers through engineering, design and installation of lighting control and lighting projects.

PRATT, EB RECEIVE NAVY GRANTS. East Hartford-based **Pratt & Whitney** won a \$33.8 million defense research contract to continue development of a fuel-efficient hybrid turbine system to power the Navy's surface fleet. Pratt will start phase two development of constant volume combustion (CVC) technology. Used in combination with jet turbines, CVC engines burn jet or diesel fuel at a constant volume in contrast to conventional fleet engines that combust fuel at a constant pressure. The Navy will also pay Groton-based **Electric Boat** (EB) \$36 million to develop technologies that improve the way its current and future fleet of submarines are built and maintained, as well as how they and their crews might perform and survive better. EB will perform concept studies on manufacturability, maintainability, survivability, hydrodynamics, acoustics and materials. If all contract terms and options are exercised by 2015, the Navy says the contract could swell to \$711.4 million.



Communication

COMCAST DIGITAL LITERACY PROGRAM. Officials from **Comcast, One Economy** and local and state lawmakers and civic leaders formally launched the Comcast Digital Connectors program at the **Asylum Hill Boys and Girls Club** in Hartford. The program is intended to teach low-income teens and young adults how to use the Internet and other online technologies to boost their digital literacy. The **Connecticut Puerto Rican Forum** also participates in the program.

CT FIRM PROMISES TO MINE 'DEEP WEB.' Stamford-based **Semantifi** has developed a Resource Description Framework-driven (RDF) semantic search platform that can search the 'Deep Web,' a term coined to describe content below the surface of the World Wide Web that traditional search engines cannot see. CEO and founder **Shree Pragada** says that Semantifi's search engine seeks to narrow the number of results to match user needs, pulling up information from multiple datasets rather than just searching for keywords or symbols like Google and Yahoo.

DPUC GETS BROADBAND MAPPING FUNDS. The **Connecticut Department of Public Utility Control** received federal broadband stimulus funds totaling \$3.7 million to conduct a statewide broadband availability mapping and strategic planning project. **Applied Geographics Inc.** of Manchester is the mapping project consultant. Included in the grant are funds for developing a strategic plan for accessibility to and adoption of broadband services in Connecticut. To view maps, take a broadband speed test and learn more about the project visit www.ct.gov/broadband/



Education & Cognition

ALUMNI COUPLE ENDOW UCONN CHAIR. President and CEO of GE Energy **John Krenicki** and his wife **Donna**, both **University of Connecticut** alumni, made a \$750,000 gift to create the John and Donna Krenicki Professorship in Biomedical Engineering. The

Krenickis are longtime philanthropic supporters of their alma mater in sustainable energy initiatives, art history and graphic design.

NSF GRANTS FOR TRINITY. This past fall, **Trinity University** in Hartford announced two grants from the National Science Foundation (NSF). An award of \$746,231, made available through federal stimulus funding, will help the school renovate five research laboratories in the **Clement Chemistry Building**. A second NSF grant for \$359,180 will pay for the acquisition of a Scanning Electron Microscope (SEM). Expected to be installed in summer 2011, the SEM will be used by faculty and students in biology, chemistry, physics, environmental science, neuroscience and engineering.

UTC GIVES \$1M TO MYSTIC AQUARIUM. **United Technologies Corp.** donated \$1 million to **Mystic Aquarium** for an expansion and transformation of the Aquarium's *Challenge of the Deep* exhibit hall. The Aquarium says that the new **United Technologies Ocean Exploration Center**, to be completed in 2012, will be the only exhibit in the world dedicated to deep sea oceanographic archaeology, geology and live, interactive exploration.

PANEL RECOMMENDS EDUCATION OVERHAUL. The **Connecticut Commission on Educational Achievement** says that Connecticut must overhaul its education system to narrow an achievement gap among low-income fourth- and eighth-graders that is the nation's worst. The commission released close to 60 specific recommendations in its blueprint for a 10-year plan. The plan's key proposals are divided into six broad categories: Accountability, High Expectations, Leadership, Excellent Teaching, Intelligent Investments and Turnaround Schools. Learn more details at www.ctachieve.org

TOPCODER BUILDING STEM EDUCATION SOFTWARE. Glastonbury software developer **TopCoder Inc.** is sharing in a \$14.2 million defense contract to devise an online regimen meant to boost flagging interest among the nation's youth in science, technology, engineering and mathematics (STEM). TopCoder will receive \$5.6 million to collaborate with the University of Arizona's "Teach Ourselves" initiative to create an online platform to introduce students to topics, relying on collaborative activities such as puzzles and problem-solving games, webisodes, workshops, and other content.

CREC \$11.5M SCHOOL GRANT. The **Capitol Region Education Council (CREC)** will receive a three-year, \$11.5 million US Department of Education grant targeted at promoting high achievement and diversity in the classroom. CREC manages eight magnet schools in Hartford, Windsor, and East Hartford and provides aid to achieve guidelines set forth by the 2008 Sheff vs. O'Neill desegregation order for Hartford's public schools. Several of the schools to benefit are STEM-focused.

QUINNIPIAC APPOINTS MED SCHOOL DEAN. **Quinnipiac University** recruited **Bruce Koeppen**, formerly dean of academic affairs and education at the **University of Connecticut School of Medicine**, to be founding dean of the **Quinnipiac University School of Medicine**. Koeppen will spearhead the direction of the \$75 million medical school, working closely with the university's academic leaders to shape its educational framework. Quinnipiac said it plans to enroll the first class in 2013 or 2014 on its new North Haven campus.

LEE INSTITUTE FOR FORENSIC SCIENCE. The **University of New Haven (UNH)** dedicated its new \$14 million **Henry C. Lee Institute of Forensic Science** building in October. The state-of-the-

IN BRIEF

Science and Engineering Notes from Around Connecticut

art building offers advanced forensic and crime scene technologies not found at most police departments in the country. Lee is a CASE member who joined the UNH forensic science department in 1965. The institute will train law enforcement officers, crime scene analysts, forensic scientists and students to solve complex crimes using cutting-edge investigative techniques. The Institute's command center will enable UNH faculty and other experts to assist investigators in addressing forensic issues in real time.



Energy

NU & NSTAR MERGER. Hartford-based **Northeast Utilities** announced in October that it will merge with Boston-based gas-electric utility **NStar** in a stock-for-stock \$4.2 billion deal, forming one of the nation's biggest utility companies. Once complete, NU can use NStar's cash flows to finance billions in transmissions projects, analysts say. The combined company will own six regulated gas and electric utilities serving nearly 3.5 million customers in Connecticut, Massachusetts and New Hampshire. The companies said that customers will not experience rate changes related to the transaction. Regulatory approvals are anticipated to be received within nine months to a year.

NU, NSTAR, HYDRO-QUEBEC. Earlier in October, a Securities and Exchange Commission filing showed that **NU** and **NStar** signed a 40-year deal for Canada's Hydro-Quebec to use the partners' proposed Northern Pass Transmission Line to route 1,200 megawatts of electricity generated from low-carbon sources. NU Chairman and CEO **Charles W. Shivery** has said that the project could meet nearly a third of the region's goal of reducing greenhouse gases

CT BANS GAS BLOW PIPE PROCEDURE ... KLEEN TO PAY CL&P FOR DELAYS. Governor **M. Jodi Rell** signed an executive order in September banning Connecticut power plants from conducting the type of pipe cleaning procedure blamed for a fatal explosion at the **Kleen Energy Power Plant** that killed six workers in February 2010. In related news, Kleen Energy Systems agreed to pay damages to **Connecticut Light & Power (CL&P)** for costs associated with delayed electricity production at the plant. The agreement allows Kleen Energy to avoid an inquiry by state utility regulators that could have forced disclosure of privately held information such as the plant's financing, construction schedule, contractor's safety practices, and data on the cause of the explosion. Estimated at \$8.4 million, the damages will help reduce bills for CL&P customers.

EPA HONORS CT. The **State of Connecticut** was one of only three states honored by the Environmental Protection Agency as one of the nation's top 50 Green Power Partners. The state government receives 17% of its electricity from renewable resources such as wind, solar, and hydro, equivalent to taking 13,000 carbon dioxide-emitting vehicles off the road every year. Connecticut ranked 36 of the 50 companies and governments on the list.

FUELCELL ENERGY POWERING CT SUB BASE. The Navy signed a three-year contract to supply energy for its Groton attack submarine base from chemical power generators built by **FuelCell Energy, Inc.** in Danbury. LoganEnergy Corp., of Sandy Springs, GA, will purchase, install and operate a pair of 300 kilowatt DFC300 fuel cells at the **US Naval Submarine Base New London** in Groton. Neither price of the units nor terms of the contract were disclosed.

NEWS FROM THE CT CLEAN ENERGY FUND (CCEF):

OPERATIONAL DEMOS. CCEF announced the launch of a new Operational Demonstration Program to fund the installation, dem-

onstration and testing of pre-commercial clean energy technologies in Connecticut by providing loans of \$150,000 to \$500,000. New features of the program include semiannual application and funding cycles, a streamlined application process, competitive judging process and an expanded list of eligible technologies. Funding of \$4 million has been budgeted for the program over the next two fiscal years.

NEW ACTING PRESIDENT. **Dale A. Hedman** became acting president of CCEF on October 1, 2010. Hedman was previously director of project development. He succeeded **Lise Dondy**, who in July announced her retirement following her five-and-a-half year tenure leading CCEF and 18-year career with **Connecticut Innovations**.

OSDG PROGRAM. CCEF launched a revised On-Site Renewable Distributed Generation (OSDG) Program and issued the first request for proposals in November. Given limited availability of funding, the CCEF implemented program changes to help staff select and recommend funding for the strongest projects and in a timely manner. The OSDG Program offers financial support, in the form of grants, to buy down the cost of installing new renewable energy generating equipment at commercial, industrial and institutional facilities in Connecticut. The total funding allocated for projects under the OSDG Program through June 30, 2012, is \$12.86 million.

For more information, see www.ctcleanenergy.com/



Environment

DEP ANALYZES PERMIT PROCESSES. The state **Department of Environmental Protection (DEP)** released its Permitting Assessment Report, as required by Public Act 10-158, analyzing the current time needed for action on permit applications and recommending steps for improving time frames without sacrificing environmental standards. The report covers 25 individual permits issued by DEP under various federal and state environmental programs. DEP's recommendations to improve timeliness of permitting decisions include more than 40 process changes; over 20 programmatic changes; the need for 53 additional program staff and further annual funding of \$500,000. The full report is available at www.ct.gov/dep/permitassessment.

PROPOSED STREAM FLOW STANDARDS REJECTED. The **General Assembly's Regulations Review Committee** unanimously rejected new stream flow regulations from the **Department of Environmental Protection (DEP)**. DEP worked in conjunction with other government agencies, environmentalists and trade associations to update the more than 30-year-old regulations and expand them to all rivers and streams, rather than only those stocked with fish, as was the case previously. The proposed regulations raised concern from businesses, water utilities, and municipalities over potential water shortages, increased costs and consumer rate increases, because redirection of water to rivers and streams and out of public use was recommended. DEP, which was required by legislation to propose the new regulations, said it plans to further consult with committee members and stakeholders to continue the process.

COVENTA SUED OVER WASTE-TO-ENERGY PLANT. For the second time in three years, **Coventa Energy's** trash-to-energy plant in Wallingford emitted excessive levels of the carcinogenic chemical dioxin, leading Connecticut **Attorney General Richard Blumenthal** to file a lawsuit against the company. The company shut down the faulty unit that was causing the problems, but Blumenthal sued to prevent future violations. A Connecticut **Department of Public Health** review concluded the amount of dioxin released during the violation did not exceed health standards.

IN BRIEF

Science and Engineering Notes from Around Connecticut



Food & Agriculture

WALMART INVESTS IN SUSTAINABLE AGRICULTURE. Walmart announced an initiative focusing on sustainable agriculture with broad goals for supporting farmers and their communities, producing more food with fewer resources and less waste, and sustainably sourcing key agriculture products. The company hopes to double its sale of locally grown products. Walmart has 5 supercenters and 28 discount stores in Connecticut. **Bill Duesing**, Executive Director of the Connecticut chapter of the **Northeast Organic Farmers Association (CT NOFA)**, says that demand is up for locally grown food, not just from big sellers like Walmart but from smaller entities like schools and hospitals and that Connecticut needs more farmers to meet the demand. In November CT NOFA announced a **New Connecticut Farmer** program, supported in part by a USDA Beginning Farmer grant. Visit www.ctnofa.org for more information.

FARMS, FOODS & JOBS. In 2010, the **Connecticut General Assembly** passed the Farms, Foods and Jobs Bill, which allows farmers to raise and process poultry for sale at their own farm stands, as well as to sell acidified foods like sauces, jams and jellies, enabling them to benefit from more direct-to-consumer sales.

HEALTHY FOOD CERTIFICATION REDUCING UNHEALTHY SNACKS. Students and teachers in Connecticut's public schools have fewer unhealthy snack food options in their cafeterias, according to a study from the **Rudd Center for Food Policy & Obesity** at **Yale** (*Journal of School Health*). On average, Connecticut school districts participating in the National School Lunch Program reduced the availability of unhealthy snack foods during the 2006-2007 school year. Districts participating in **Connecticut's Healthy Food Certification**, first implemented in that year, showed greater reduction of unhealthy foods than districts that did not participate.



Health

HARTFORD HOSPITAL CANCER WING. **Hartford Hospital** recently opened a 26-bed, state-of-the-art inpatient cancer treatment unit on its main campus. The \$11.5 million addition, mainly self-funded by the hospital, is intended to strengthen Hartford Hospital's position as a leader in treating cancer patients. The all private-room facility is an extension of the hospital's **Helen & Harry Gray Cancer Center**. Hospital officials say the unit was created on an evidence-based design intended to reduce falls, improve patient safety, offer a better night's sleep and improve healing.

BEACON HONORS NLP. This year the **Biomedical Engineering Alliance & Consortium (BEACON)**, in its 10th anniversary year, honored Westport-based **NLP International Inc.** with the BEACON Medical Technology Award. The annual award recognizes an individual or organization/corporation for significant advancement in the development, commercialization and/or manufacture of new medical technology. NLP acquired the worldwide license to market and distribute a natural language processing system for patient medical records that has transformed the way in which clinical staff can enter patient data for sorting and analysis.



High Technology

ALTERNATIVE TO GOLD IN ELECTRICAL APPLICATIONS. CASE member **Mark Aindow** and **S. Pamir Alpay**, both professors of

materials science and engineering at the **University of Connecticut**, **UTRC** fellow **Joseph Mantese**, and graduate students **Bilge Senturk** and **Yong Liu** have developed new classes of materials that behave much like gold and can be used in electrical applications (*Applied Physics Letters*, Oct. 12). Their work was funded by a grant from the US Army Research Office. Expensive metals like gold and platinum are attractive for their conductivity and resistance to oxidation and corrosion. The team synthesized various alloys using inexpensive base metals, demonstrating an improvement in contact resistance of up to one-million-fold over that for pure base metals.

MURI AWARD TO DEVELOP ADVANCED CAPACITORS. The **University of Connecticut** is collaborating on a major, multi-institutional project through funding from the US Department of Defense's Multidisciplinary University Research Initiative. **Ramamurthy Ramprasad** of the Department of Chemical, Materials & Biomolecular Engineering and the Institute of Materials Science is serving as principal investigator. UConn is expected to receive \$3.6 million over the five years of the project. The objective is to employ computational methods to develop new classes of polymeric films, featuring specific dielectric properties, for use in high energy density capacitors which are used in a wide variety of applications.

CTTECH INCUBATOR. The **CTech IncUBator**, a partnership between **CT Innovations** and the **University of Bridgeport**, opened its 2,400 square-foot space in Bridgeport in October. CTech IncUBator will house up to six technology ventures interested in commercializing technology in the information technology, digital media, advanced materials, clean technology and other tech industry sectors.



Transportation

ELECTRIC VEHICLE REPORT & CHARGING STATION. The **Governor's Electric Vehicle (EV) Council** released its final report in September, establishing a goal of 25,000 EVs on Connecticut roads by 2020. Recommendations include incentive programs, charging station infrastructure build-out and pursuit of special grant and loan programs. The report followed the announcement in August that **Northeast Utilities** and **Control Modules Industries** of Enfield will pay to install an EV charging station at the **Legislative Office Building**.

CT 2ND LARGEST FUEL CELL BUS FLEET. This fall, **CTTransit** added four new fuel-cell hybrid electric buses to the one that has been in service since 2007, making the central Connecticut transit system the largest fuel cell bus fleet outside of San Francisco. CTTransit is building a facility to store up to six fuel cell buses and will install a hydrogen fueling station onsite. The buses' fuel cells were built by **UTC Power** of South Windsor. CTTransit expects delivery of 41 hybrid electric/ diesel fuel buses by early 2011.

ALTERNATIVE FUELING IN WALLINGFORD, MERIDEN. **SunHydro**, the sister company of fuel cell manufacturer **Proton Energy Systems**, opened a hydrogen fueling station in Wallingford this fall. It is to be the first of a series of privately-funded, publicly accessible stations planned for the I-95 corridor. SunHydro uses solar power to drive the process of manufacturing hydrogen. In addition, the **City of Meriden** opened its first compressed natural gas fueling station for eight municipal fleet CNG vehicles. The station was financed through the **Connecticut Clean Cities Future Fuels Projects**.

— *Compiled and edited by Ann G. Bertini, Asst. Dir. for Programs*

From the National Academies (from page 1)

The challenge of increasing underrepresented minority participation and success in STEM requires commitment from every type and size of learning institution and from predominantly white institutions to those that historically serve minorities, the report says.

http://www.nap.edu/catalog.php?record_id=12984

◆ Sustained Investment in Education, Research Urged

A new report requested by the presidents of the three national academies and authored by members of the committee that wrote the influential 2005 report *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, concludes that the outlook for America's ability to compete for quality jobs in the global economy has continued to deteriorate in the last five years, and the nation needs a sustained investment in education and basic research to keep from slipping further. The report, *Rising Above the Gathering Storm, Revisited: Rapidly Approaching Category 5*, notes that the latitude to fix the problems has been severely diminished by the economic recession and the growth of the national debt over this period. In order to sustain the progress that has begun, it will be necessary to both reauthorize the America COMPETES Act and "institutionalize" oversight and funding of Gathering Storm recommendations so that funding and policy changes will routinely be considered in legislative processes.

http://www.nap.edu/catalog.php?record_id=12999

◆ Long-Term Effect of Ocean Acidification Unknown

The ocean has absorbed a significant portion of all human-made carbon dioxide emissions. This benefits human society by moderating the rate of climate change, but also causes unprecedented changes to ocean chemistry. Carbon dioxide taken up by the ocean decreases the pH of the water and leads to a suite of chemical changes collectively known as ocean acidification. The long-term consequences of ocean acidification are not known, but are expected to result in changes to many ecosystems. *Ocean Acidification: A National Strategy to Meet the Challenges of a Changing Ocean* reviews the current state of knowledge, explores gaps in understanding, and identifies several key findings.

Ocean acidification is a global problem that will intensify with continued CO₂ emissions and has the potential to change marine ecosystems. The US government has taken positive initial steps by developing a national ocean acidification program, but more information is needed to fully understand and address the threat that ocean acidification may pose to marine ecosystems.

http://www.nap.edu/catalog.php?record_id=12904

◆ Engineering a Quieter America

A new report from the National Academy of Engineering entitled *Technology for a Quieter America*, finds that exposure to environmental noise is a widespread problem in the United States and calls on the federal government to strengthen the regulatory framework for occupational noise, encourage the development and deployment of technologies for noise control, foster demand for low-noise products, and improve environmental noise metrics.

The report assesses major sources of noise (transportation, machinery and equipment, consumer products, etc.), how they are characterized, efforts to reduce noise emissions, and efforts to reduce noise in workplaces, schools, recreational environments, and residences. The report reviews regulations that govern noise levels and the roles of federal, state, and local agencies in noise regulation. It also examines cost-benefit trade-offs between different approaches to noise abatement, the availability of public information on noise mitigation, and noise-control education in US schools of engineering.

http://www.nap.edu/catalog.php?record_id=12928

The following Connecticut scientists were elected to the National Academies in 2010:

NATIONAL ACADEMY OF SCIENCES

Ruslan Medzhitov, PhD

David W. Wallace Professor of Immunobiology and investigator, Howard Hughes Medical Institute, Yale University School of Medicine

INSTITUTE OF MEDICINE

Peter Cresswell, PhD

Eugene Higgins Professor of Immunobiology and investigator, Howard Hughes Medical Institute, Yale School of Medicine

Jack A. Elias, MD

Waldemar Von Zedtwitz Professor of Medicine, professor of immunobiology, and chair, Department of Internal Medicine, Yale School of Medicine

Robert S. Galvin, MD

Chief Executive Officer, Equity Healthcare; and adjunct professor of medicine and health policy, Yale School of Medicine

John H. Krystal, MD

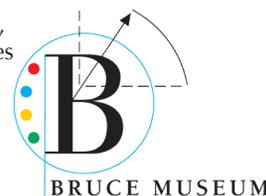
Robert L. McNeil Jr. Professor of Translational Research and chair, Department of Psychiatry, Yale School of Medicine; Chief of Psychiatry, Yale-New Haven Hospital, and director, Clinical Neurosciences Division, VA National Center for PTSD

Charles J. Lockwood, MD

Anita O'Keefe Young Professor of Obstetrics, Gynecology, and Reproductive Sciences, and chair, Department of Obstetrics, Gynecology, and Reproductive Sciences, Yale School of Medicine

Greenwich's Bruce Museum Engages Teens

The Bruce Museum, located in Greenwich, CT, is unique among museums: it celebrates both art and science in twelve changing exhibits per year. It also offers permanent science exhibitions that feature the local history from billions of years ago to today. Upcoming exhibits in 2011 include:



- *Arctic Sanctuary: Images of the Arctic National Wildlife Refuge*
- *Three Sisters & Corn Maidens: Native American Maize Cultivation & Customs*
- *Bling: Its Origins, Its Impact*

Visit the Bruce Museum's website (www.brucemuseum.org) for a complete list of exhibitions and their duration dates.

Over the past several years, the Bruce Museum has concentrated on expanding its science outreach programs to include teenagers. The Bruce Museum Youth Committee (Youth@Bruce) program creates awareness about the importance of science by encouraging ownership of museum exhibitions. Teens are engaged in marketing and fundraising campaigns, the latest being for the *Arctic Sanctuary* exhibit, opening March 5, 2011.

Youth@Bruce also participates in the Association of Science Technology Centers' Youth Inspired Challenge, a national program to strengthen science, technology, engineering, and mathematics curricula in American schools. Youth@Bruce will host its first sciCafe for friends of the museum, volunteers, elected officials and others on March 26, 2011, featuring Jeff Jones, photographer and author of *Arctic Sanctuary*. To learn more about this exhibit and Youth@Bruce, go to <http://kck.st/cVupdu>.

Visit our web site at www.ctcase.org

Data Storage (continued from page 2)

stovepipes can be costly and exclusive and come with inherent risks. We want to maximize our effectiveness and efficiency by providing more coherent policies and tools to meet the needs of our digital content producers and stewards."

ODAI has published guidelines for researchers to generate data management plans in response to the new National Science Foundation (NSF) requirement. "Several funding organizations now require researchers to submit a plan for how they will manage the data generated," Bellinger said. "Developing a plan to manage data before beginning research is essential to ensuring its accessibility and usability. Managing data in active research ultimately makes it easier to share data during and after the project. Sound data management practices reduce the time and resources required to sustain data over time and decrease the risk of data loss or corruption."

Girvin, Loew and Sherman agree that data management plans are essential.

"Researchers rely on notes about where to find the conditions present at the time of the experiment, for example, the working condition/calibration of the telescope, where the telescope was aimed, what filter was used," Girvin said. "Without meticulous description of these important elements and information about how the data are categorized, the data are useless."

"Federal agency requirements for researchers to provide access to their data and describe how they will deal with data curation will provide an archival record of what the provenance was at the time of data collection," Girvin said. "Researchers will have to be very disciplined and keep meticulous notes about the data – they will need to report the data on the data and provide a map to help people find data within the massive data set."

Loew agreed that plans "would help a great deal. The granting agencies and/or professional journals need to enforce annotation requirements to keep data as useful and reusable as possible," he said.

According to Sherman, the research community is exploring the use of cloud computing in which storage is distributed among multiple servers connected by networks. "This approach can make searches much faster, since it's like splitting a book into multiple sections and searching through all of the different sections at the same time," he said. "It also offers the advantage of being able to selectively replicate some of the data on more than one machine. This may be particularly important for data that are used frequently or are impossible or costly to replace."

Girvin says Yale also is considering subsidizing the price of storage so that people don't buy their own storage vehicles and put them on the bookshelf at home where nobody can access the data. "It's a delicate balance – making data storage cheap enough that researchers aren't tempted to use their own storage media, but charging enough to prevent people from keeping every scrap of information – such as data taken when a machine was broken," he said. "Data storage is a finite resource and we need to be selective about the information we store."

All welcome the push by funding agencies to tie data storage and access to their research proposal requests. "The next step would be for these agencies to really expand their funding for research on storage, indexing and preservation, which could ensure an infrastructure that allows tomorrow's researchers to build on today's research," Sherman said. "People are interested in developing new science, but it is equally important that we don't lose the results from 'old' science." —*Karen Cohen, science writer and owner, The WriteStuff, LLC.*