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CTDOT relies on state-of-the-art tools to keep traffic moving in winter weather

Winter driving is something that most of us would like to avoid, but unfortunately, in Connecticut, driving on snow-covered roads usually can't be avoided entirely. Just-in-time delivery demands that businesses place vehicles on the roads no matter what weather conditions exist. Meeting this demand requires that governments provide clear roads sooner, and with improved levels of service, during or immediately after winter weather events. However, the winter maintenance arsenal includes tools, such as chemical deicers, that have been implicated recently in contributing to accelerating corrosion of vehicles.

Fueled by media reports in recent years, a common perception of the public is that chemicals now used for winter maintenance of roadways, parking lots, etc., are detrimental to automobiles, highway infrastructure and the environment. The trucking industry has also focused attention on this issue by reporting that road deicing chemicals cause deterioration of truck components such as brake lines at faster rates in recent years. This increased attention in Connecticut led to the passage of Public Act 14-199 requiring the Connecticut Department of Transportation (CTDOT) "to perform an analysis of the corrosive effects of chemical road treatments on state snow and ice equipment vehicles; state bridges, highways and other infrastructure; and the environment." In response, CTDOT contracted with the Connecticut Academy of Science and Engineering (CASE) to perform a literature-based study of these issues. The Connecticut Transportation Institute at the University of Connecticut served as CASE's research team.

(See Winter Highway, page 2)

New England Air Museum continues to soar

The New England Air Museum (NEAM), adjacent to Bradley International Airport in Windsor Locks, chronicles our region's dynamic aviation history and ongoing aerospace legacy. From the first balloon flights over Hartford in the mid-1800s to the dominance of Pratt & Whitney, Sikorsky and other regional companies, Connecticut has played a much greater role in the story of flight than most people would imagine. NEAM's collection includes over 100 aircraft and thousands of artifacts that help tell the story of innovation, technology, and Yankee ingenuity.

A young visitor and his dad give a 'thumbs-up' from the cockpit of an F-100 supersonic jet fighter at the New England Air Museum in Windsor Locks. [Photo: New England Air Museum]

The museum's collection includes two Sikorsky flying boats, both powered by Pratt Wasp engines using Connecticut-manufactured Hamilton Standard propellers. This combination powered a number of aircraft including transports, airliners and WWII fighters and bombers. Additionally, on display is an F-100 supersonic jet fighter powered by the Pratt J-57

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From the National Academies

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

◆ The Employability Divide: Transforming US Education to Create Lifelong Learners

According to the author of "Education Transformation to Support Lifelong Learning" in the Fall 2015 online journal *The Bridge* from the National Academy of Engineering, current education methods and content cannot effectively prepare today's students for the jobs of tomorrow, thus creating an "employability divide" as degree holders emerge into a workplace without the skills that employers need. The need for lifelong learners is now greater than ever, and the need for lifelong learning has implications for every portion of the education and employment pipeline—in fact, the author argues, a linear pipeline may no longer be the right model for the US educational process.

The article explores two foundational challenges for lifelong learning: the first is to prepare students to learn how to learn, rather than accumulate facts. The second is to use data on both employer skill needs and individual capabilities and interests to create personalized guidance for learners.

Education in America has often struggled to respond in a timely manner to changes in the economy and the workforce. The need for timely adaptation is now acutely important in the rapidly evolving national and global economy. Efforts to improve success call for a combination of enhanced education at all levels, technology (particularly data-driven insights as education becomes more digital and instrumented), and public-private partnerships between academia and employers.

http://www.nae.edu/Publications/Bridge/142833/145193.aspx

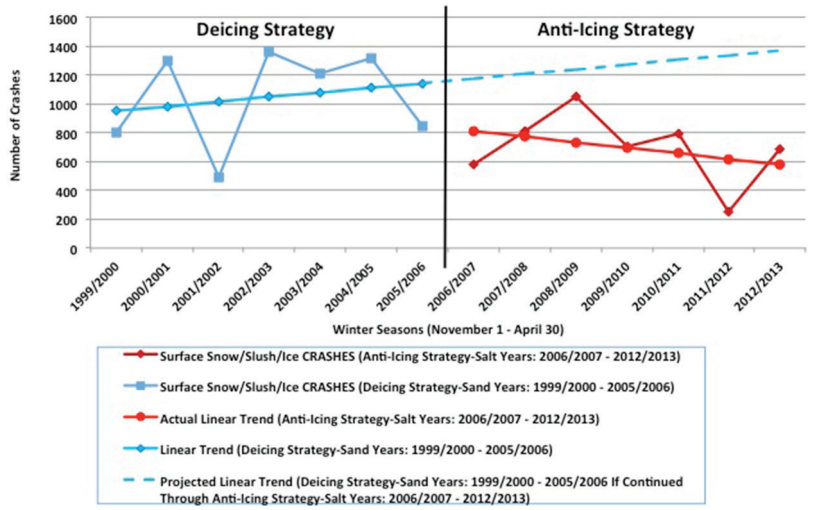
(See NAS, page 7)

Winter Highway *(from page 1)*

Not surprisingly, the study found that the most commonly used chemical deicer in Connecticut—as well as throughout the snowbelt regions of the United States—is sodium chloride, also known as rock salt. This has been the case for over 75 years. Rock salt continues to dominate for deicing and anti-icing of roadways for several reasons: steady availability of very large quantities (as much as 22 million tons per year used in North America); affordability; and a long, proven track record for effectiveness as well as safe handling and storage. The study also identified several alternative deicing chemicals including organic deicing chemicals such as calcium magnesium acetate (CMA), potassium acetate, sodium acetate, sodium formate, potassium formate, urea, propylene glycol and agricultural-based biodegradable by-products. Other inorganic compounds that are similar to rock salt include magnesium chloride and calcium chloride.

One of the more recent developments in the northeastern states—including Connecticut—has been the mixing of liquid magnesium chloride or calcium chloride with rock salt. Due to their ability to melt snow and ice at lower temperatures than rock salt, these other chlorides are used separately in those states with extremely cold climates. It is these other inorganic salts that have garnered the most negative attention in recent years. Numerous laboratory studies confirm that because of their ability to attract moisture at lower atmospheric temperatures, magnesium chloride and calcium chloride are potentially more corrosive to steel and other metals than sodium chloride. Laboratory studies have also found that magnesium chloride is more detrimental to Portland Cement Concrete, which is commonly used in bridges and other transportation structures.

Figure 1.
Vehicle Crashes Involving Injuries
Surface Condition Equal to Snow/Slush or Ice CTDOT Roads



Even though the potential exists for increased corrosion from magnesium chloride and calcium chloride, the study found that of the total chlorides applied to roadways by CTDOT during five recent winter seasons (2009/2010 through 2013/2104), a mere 1% was composed of magnesium chloride, and currently 0% is calcium chloride, as CTDOT hasn't used calcium chloride since 2011. Liquid magnesium chloride is used by the department to coat solid rock salt at a rate of 1 gallon solution (30% magnesium chloride and 70% water by weight) to 200 lbs. of rock salt. This is equivalent to applying 1 gallon of liquid magnesium chloride per lane-mile for each maintenance application.

Some of the alternative organic chemicals offer a few advantages over the inorganic salts; yet they all fall short in a number of categories. Most are extremely expensive relative to rock salt—on an order of magnitude of 20 to 30 times the cost of salts—and only limited quantities are produced and currently available. Some have had only limited use in the United States. Most important, however, is the potential for negative environmental impact due to Biochemical Oxygen Demand (BOD), which occurs when organic chemicals decay using oxygen from the surrounding environment. BOD can rapidly deplete the dissolved oxygen in bodies of water, thereby negatively impacting aquatic wildlife.

Deicing chemicals aside, it was found that CTDOT's winter maintenance policy "to provide a standard of winter maintenance that provides for the motoring public reasonably safe roads during and after adverse weather conditions throughout the winter season" addresses the multiple challenges of unpredictability of winter weather events in Connecticut; an increasingly mobile society; and the extensive level of resources required for maintaining mobility during adverse weather events. The CASE study found that CTDOT meets these challenges by employing state-of-the-art practices, investing in new equipment and technology, properly maintaining equipment, training staff, participating in regional and national studies, and providing a level of service that Connecticut motorists have come to expect.

As part of this study, the safety aspect of the CTDOT's policy was investigated through an analysis of vehicle crashes occurring both before and after the winter season of 2006/2007. Figure 1 shows a decrease in crashes involving injuries when road surfaces were snow, slush, or ice covered beginning in the season of 2006/2007.

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Science and Engineering Notes from Around Connecticut

Biomedical Research

NIH GRANT TO FUND NEW CENTER AT JACKSON LAB. **The Jackson Laboratory for Genomic Medicine** announced a $10 million grant from the National Institutes of Health to launch the **Center for Precision Genomics at Jackson Laboratory**. The center will collaborate with researchers from seven universities and medical centers across the United States, including UMass Medical School, Cedar Sinai Medical Center, Columbia University Medical Center, Emory University, Nationwide Children's Hospital and the University of California's San Diego and San Francisco campuses. CASE member and Jackson Laboratory President and CEO **Edison Liu** believes, "Ultimately, the Center will generate new disease modeling processes and pipelines, data resources, research results and models that will be swiftly shared through JAX's proven dissemination pipelines to accelerate translation to medical benefit."

NEW UCONN-JACKSON LAB JOINT CENTER. On August 26, **UConn**, including **UConn Health** and **The Jackson Laboratory for Genomic Medicine**, signed an agreement to launch a $7.7 million, **Single Cell Genomics Center** specifically focused on studying the cell. Major advances in automation and microfluidics will allow researchers a more precise view of cellular mechanisms.

JOINT RESEARCH PROJECTS FOCUS ON CANCER TYPES. This fall, the Cancer Center at Beth Israel Deaconess Medical Center (BIDMC) and **The Jackson Laboratory** (JAX) launched seven joint research projects to study a variety of cancer types, including multiple myeloma and lung, breast, prostate, and brain cancers. Each of the seven projects is led by co-principal investigators from both institutions. CASE member **Jacques Banchereau** of JAX is partnering with Ramy Arnaout of BIDMC to investigate the role of T-cells and the immune system in cancers.

BIOINNOVATION CT TO INVEST $10M IN 'PITCH.' On September 10, **BioInnovation Connecticut**, managed by **Connecticut Innovations,** announced a three-year, $10 million investment in the P**rogram in Innovative Therapeutics for CT's Health (PITCH)**. The program, led by CASE member **Craig Crews** of **Yale University** and **Dennis Wright** of **UConn**, will guide new biopharma and biotechnology ventures based on research from the state's higher education system. The initiative will focus on translating science discoveries into data packages to secure external investment.

RESEARCH SHOWS EPSTEIN-BARR, CANCER LINK. In an article published September 16 in *PLOS ONE*, scientists at the **Western Connecticut Health Network Research Institute** in Danbury reported research finding that when human cells with the Epstein-Barr virus pass through a tumor, the virus is reactivated and the tumor and virus may work together to suppress the immune system. Although scientists have known the Epstein-Barr virus is linked to lymphomas, this study potentially broadens its involvement in cancer, including the most common types of lung, colon, prostate, liver and bladder cancer.

Business & Industry

PFIZER ANNOUNCES MERGER WITH ALLERGAN. **Pfizer Inc.** announced on November 23 that it had struck a $160 billion deal to merge with its smaller rival, Allergan plc, in one of the biggest takeovers in the health care industry. The deal would be structured as a so-called reverse merger, in which Dublin-based Allergan would technically be the buyer, and represents the largest example so far of a corporate inversion, in which a US company merges with a foreign company and shifts its headquarters overseas in order to lower its corporate taxes. Pfizer, which has a research center in **Groton**, is expected to lead the combined company, which would have about 110,000 employees worldwide and more than $63 billion in combined sales with a product portfolio that includes Viagra, Celebrex, Botox and the cosmetic treatment Juvéderm. The announcement raised concerns in Connecticut's bioscience industry, although some experts predict that because the deal brings together two companies with vastly different pharmaceutical interests, it may be more about growth opportunities than consolidation and restructuring. The transaction, which requires shareholder and regulatory approval, is expected to close in the second half of 2016, but could face stiff opposition from lawmakers in the United States.

CHINESE AIRLINE CHOOSES PUREPOWER ENGINE. **Pratt & Whitney** (P&W) announced this fall that Sichuan Airlines agreed to purchase PurePower, PW1100G-JM engines to power 24 Airbus A320neo planes. According to P&W, Sichuan, offering flights to 200 destinations in Asia, North America and Australia, is the first Chinese airline to order PurePower engines directly. The airline was an initial customer for the company's V2500 engine launched 20 years ago.

CCMC OPENS FAMILY RESOURCE CENTER. On October 22, **Connecticut Children's Medical Center** opened the **United Technologies Family Resource Center,** a 2,000-square foot facility providing families with resources including educational materials, a simulation room to practice treatment administration, a library, movie room, computer stations, and lounging area to cope with a hospital stay. The center is expected to serve more than 300,000 patients each year. **United Technologies Corporation** donated $1.5 million towards creating the space.

GENENTECH, ARVINAS SIGN DEAL. New Haven biotech firm **Arvinas**, founded by Yale developmental biology professor and CASE member **Craig Crews,** announced an agreement with **Genentech**, the world's largest pharmaceutical company specializing in cancer. Arvinas produces a class of drugs known as protein degenerators, which cause cancer cells to eliminate proteins used to replicate and reproduce. By bonding to the "rogue proteins," the drugs cause the cell's natural recycling mechanism to break down the targeted protein. Genentech will provide financial support and research support while Arvinas will receive over $300 million in "milestone fees" from Genentech in the years ahead. Current projects include a prostate cancer treatment expected to move to clinical studies by next year.

CT STARTUP WINS TOP PRIZE. Connecticut-based **Biorasis** was recently awarded the MassChallenge's top prize at their annual awards ceremony. The company was one of only four "Diamond Winners," receiving a cash prize of $100,000. They were also one of two teams to receive the Sidecar Award, providing an additional $200,000 in non-dilutive funding. The technology developed by Biorasis, the Glucowizzard™, is an ultra-small implantable biosensor for continuous, reliable glucose monitoring. This needle-implantable device wirelessly transmits glucose levels to a watch-like unit for real-time display, which in turn communicates with personal digital accessories like a smartphone. The technology can also function effectively for 3-6 months without user intervention and saves between 50-70% in annual healthcare costs.

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) 571-7143, or contact us at acad@ctcase.org,

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Communication

CT FIRM PARTNERS WITH SCHOOL FOR THE DEAF. **Wearsafe Labs, Inc.**, a Hartford-based startup developing advanced wearable personal safety products, recently announced a partnership with the American School for the Deaf to launch the Wearsafe Tag, a device that clips onto clothing. When activated within 200 feet of a user's smartphone, a selected network will receive an alert through email and text, with the network using GPS information as well as audio to identify the user's location and condition. Users can also receive tactile confirmation to let them know their alert has been received. If required, network members can call 911 directly from the app.

CABLE ACQUISITIONS. Cogeco Cable Inc. announced recently that its subsidiary, Atlantic Broadband, has acquired **MetroCast Communications of Connecticut, LLC**, and its parent company, Harron Communications, LP. The cable system serves approximately 23,000 TV, 22,000 Internet and 8,000 telephone customers in nine communities in eastern Connecticut.

TEXAS FIRM ACQUIRES CAMPUS TELEVIDEO. Texas-based Apogee Telecom Inc. announced in early September its acquisition of Connecticut's **Campus Televideo**, a company providing video services for higher education. Apogee Telecom provides high-speed campus residential networks and other networking products, including video, to customers including the University of Texas, Florida State University and Southwestern University.

Education & Cognition

VOTERS OKAY NEW AGRISCIENCE AND TECHNOLOGY CENTER. Voters in **Washington, Roxbury** and **Bridgewater** —the towns that make up the Region 12 School District— in November overwhelmingly approved a proposed $39.5 million **Shepaug Agriscience STEM Academy** to be built at **Shepaug Valley School** in Washington, making it the state's 20th such center. There will also be a focus on STEM subjects—science, technology, engineering and math. The agriscience program includes a variety of agriculture-related fields attracting students from **Brookfield, Danbury, New Fairfield, New Milford, Newtown** and **Sherman** and will serve students in grades nine through 11.

PROGRAM FOCUSES ON ADVANCED MANUFACTURING TECHNOLOGY. In September, **Naugatuck Valley Community College** (NVCC) launched a second class in its Advanced Manufacturing Technology Program at **Henry Abbott Technical High School** in Danbury. Students who earn their certificate in Advanced Manufacturing Machine Technology are qualified to work in machine technology and computer numerical control (CNC) manufacturing environments.

SIKORSKY LAUNCHES 5TH HIGH SCHOOL STEM CHALLENGE. **Sikorsky Aircraft Corp**. launched its 5th annual Science, Technology, Engineering, and Math (STEM) Challenge for Connecticut high school students in September at the **Chester Airport**, where students and mentors were greeted by a surprise landing of a Black Hawk helicopter. Students are mentored by Sikorsky engineers as they work to solve an engineering design problem. The year-long competition runs until May 21, 2016, and is co-sponsored by Sikorsky Aircraft and **Connecticut Corsair.** This year's challenge is to design a hoist apparatus to recover a downed Corsair aircraft in a scenario in which the aircraft is at risk of drifting out to sea or sinking.

SCSU OPENS NEW SCIENCE AND LAB BUILDING. **Southern Connecticut State University** (SCSU) officially opened its Academic Science and Laboratory Building, a $49 million project featuring interactive laboratory spaces. Massachusetts-based Perkin Elmer installed high-tech scientific laboratory instrumentation in a partnership to benefit various university science departments including nanotechnology, optics, biology, chemistry, environmental science and earth science. CASE member **Christine Broadbridge**, SCSU's director of STEM initiatives, noted the partnership is "emblematic of the multidimensional relationships bubbling up between our campus community and industry thought leaders."

Energy

'GREEN' ANTENNA COULD DOUBLE SOLAR CELL EFFICIENCY. Researchers led by **UConn** chemistry professor **Challa Kumar** have developed a "green" antenna, doubling the efficiencies of certain kinds of solar cells, while making them more affordable. Kumar's team developed an artificial green antenna using biological and non-toxic materials that can collect unused blue photons and convert them into lower energy photons using organic dyes, which the silicon used in many solar cells can turn into current. According to the American Chemical Society, the lab prototypes of solar cells are expected to have higher efficiencies when compared to that of commercial solar cells, which have a maximum conversion rate of 25%.

BRIDGEPORT RECOGNIZED FOR GREEN JOBS, CLEAN ENERGY. The **City of Bridgeport** has been recognized by the White House for efforts to create green jobs and promote clean energy. Green initiatives include Bridgeport's **Eco-Technology Park** and **Dominion Fuel Cell,** which uses clean energy to power 15,000 homes.

PURA OKAYS INNOWATTS EXPANSION. This fall, the **Connecticut Public Utilities Regulatory Authority** granted approval to Innowatts, LLC, a technology company specializing in personalized energy products, to expand its services to Connecticut's deregulated areas. The goal is to make homes more efficient and energy affordable through Innowatt's platform, allowing residents to make energy-conscious decisions regarding gas and electricity providers.

EASTERN CT TO JOIN 'ACCELERATE PERFORMANCE'. This fall, the **Institute for Sustainable Energy** at **Eastern Connecticut State University** partnered with the National Renewable Energy Lab and Seventhwave in a $2 million cooperative agreement with the US Department of Energy (DOE) to maximize energy efficiency in new building construction. The national initiative, "Accelerate Performance," will use DOE resources to concentrate on a performance-based procurement approach requiring building owners to include energy outcomes in new construction contracts and to ensure accountability for building performance after construction.

FIRST CT WIND FARM POWERS UP. On October 22, **BNE Energy** powered up the first of two wind turbines on Connecticut's first wind farm, located on 10 acres in Litchfield County. BNE Energy has a 20-year contract to sell the turbine-generated power to **Eversource Energy**. The turbines were built by Connecticut-based **General Electric**, with Green Bank financing $2.8 million and BNE contributing $2.1 million. After both turbines are operational, they are expected to produce five megawatts of electricity.

STATE AMONG TOP 10 FOR ENERGY EFFICIENCY. A recent ranking from the American Council for an Energy-Efficient Economy rated Connecticut among the top ten energy-efficient states in the country along with Massachusetts, California, Vermont, Rhode

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Island, Oregon, Maryland, Washington, and New York, with Minnesota and Illinois tied for 10th place. Connecticut was noted for its financial incentives and energy efficiency investments.

Environment

LEAF PROGRAM HELPS STUDENTS UNDERSTAND NATURAL WORLD. This summer, **Elmer Galvez,** a recent graduate from New Haven's **Common Ground High School**, interned with the Nature Conservancy as part of Connecticut's **Leadership in Environmental Action for the Future** (LEAF) program to improve students' understanding of the natural world. The program began in 1995 and is now in 28 states. A nationwide survey found that 30% of LEAF participants went on to pursue careers related to the environment. Connecticut's LEAF interns focus on **Long Island Sound** issues.

DEEP OKAYS PLAN TO DUMP DREDGING SEDIMENT. In August, **Rob Klee**, commissioner of the **Connecticut Department of Energy and Environmental Protection**, endorsed a US Army Corps of Engineering plan to dump dredged materials from waterways and harbors into areas of **Long Island Sound**. Klee stated the Sound must be used because sediment from Connecticut waterways is fine-grained, making it impossible to recycle. The Corps is examining alternatives for handling nearly 53 million cubic yards of material and 10 disposal sites for 60 dredging projects.

CT RANKS 10TH IN PER CAPITA SOLAR POWER CAPACITY INSTALLED IN 2014. A recent study, "Lighting the Way III: The Top States that Helped Drive America's Solar Energy Boom in 2014," by the research and policy arm of **Environment Connecticut** finds Connecticut ranks 10th nationally for solar power capacity per capita installed in 2014, with 13 watts of solar electric capacity per person installed last year. Nevada led all of the states in 2014, with 119 watts per capita, according to the study. Part of this success is credited to supportive state policymaking.

$6M IN GRANTS FOR ENVIRONMENTAL EFFORTS. This fall, Governor **Dannel Malloy** announced that nearly $6 million in grants will be made available for seventeen communities, allowing purchase and preservation of 949 acres of land, assistance for various environmental efforts to four urban communities, and support for environmental education and community gardens. Funding will come from the 2005 Community Investment Act and state bond funds, and the Open Space and Watershed Land Acquisition Program, administered by the **Connecticut Department of Energy and Environmental Protection.**

Food & Agriculture

WOODSTOCK FARM JOINS PRESERVATION LIST. On August 6, an agreement was finalized conveying development rights for **Elm Farm—**a multi-generational, award-winning dairy farm in **Woodstock**—to the **State of Connecticut.** This is the 311th farm to be protected under the state's **Farmland Preservation Program**. In 2012, the farm received the New England Green Pastures Award for outstanding management practices. The farm is managed in accordance with a Conservation Plan and Forest Management Plan developed through the USDA-NRCS.

NEW LAW PROTECTS 'CT GROWN' BRANDING. Effective October 1, all products sold at farmers markets as "Connecticut Grown" must include the name and address of the farm or business where they were grown or made. "Connecticut Grown" signs must be readily visible; be at least 3x5 inches; lettered clearly; state something similar to "This farm product is Connecticut Grown"; and include the producer's name and address. According to Connecticut **Agriculture Commissioner Steven K. Reviczky**, the law ensures integrity for the "Connecticut Grown" brand.

FREE BREAKFAST, LUNCH OFFERED TO ELIGIBLE SCHOOLS. As of fall 2015, the federal Community Eligibility Provision (CEP) program is offering free breakfast and lunch to seven eligible school districts. Individual schools, or entire school districts, may qualify. Every student from **Waterbury, New Britain, Hartford, New Haven, New London, Windham,** and **Bridgeport** has access to free breakfast and lunch. Three of the seven schools in **Vernon** qualify.

DEEP TO ADVISE ON RECYCLE-TO-WASTE RULES. Starting this fall, the **Department of Energy and Environmental Protection** (DEEP) will work with banquet halls and conference centers to determine whether the separate recycle-to-waste law applies to them. The 2011 law, which was later revised, required entities that generate about two tons of food waste per week, such as supermarkets, to separate and recycle "food residuals" beginning Jan. 1, 2014. The rule only applies, however, if they're located within 20 miles of a recycling facility. If the law applies, DEEP will help with compliance. Starting in 2020, producers of at least one ton of weekly food waste will need to recycle their food waste. DEEP encourages college campuses and similar entities to voluntarily participate.

POULTRY OWNERS ASKED TO REGISTER FLOCK LOCATIONS. In October, **Connecticut Department of Agriculture** officials asked poultry owners to register flock locations to reduce risk associated with Highly Pathogenic Avian Influenza (HPAI). HPAI resulted in the destruction of more than 48 million birds last year. No cases have been detected in Connecticut's poultry population of five million. Voluntary registration provides information about the locations and numbers of poultry in the event HPAI is found in Connecticut.

Health

CT RESEARCHERS FOCUS ON ESOPHAGAEL ATRESIA. In August, researchers at **Connecticut Children's Medical Center** announced work on esophagael atresia, a life-threatening congenital birth defect preventing babies from using their mouths to eat. **Christine Finck**, head of pediatric surgery, said she and her staff are regenerating the esophagus using a patient's own cells to repair or replace the defected organ. "We have a scaffold that's synthetic that we know the body can handle, and we seed it with biopsy cells from a patient, epithelial cells, and we recreate an esophagael type of tube," Finck said. It may be five years before doctors can implant a regenerated esophagus.

CT TEEN TAKES TOP SCIENCE FAIR HONORS. On September 22, **Olivia Hallisey,** a **Greenwich High School** junior, won the 2015 Google Science Fair with her project to develop a quick, effective Ebola detection test providing results in less than 30 minutes, and before symptoms appear. The test, made of antibodies, detects Ebola viral antigens based on a chemical color change if antibodies in the sample bind to Ebola proteins. Hallisey used silk fibers to stabilize the chemicals on card stock, allowing them to remain at room temperature for up to three weeks while maintaining effectiveness. Hallisey was awarded $50,000 in scholarships from Google. Hallisey has won several Connecticut-based awards for her project, including a first place in the Life Sciences/Senior Division of the 2015 Connecticut Science and Engineering Fair, and Grand

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Award Winner at the Intel International Science and Engineering Fair. She was also a winner of the 2015 H. Joseph Gerber Medal of Excellence, an award of the Connecticut Academy of Science & Engineering presented in partnership with the Connecticut Center for Advanced Technology.

WEST NILE CASES REPORTED IN BRIDGEPORT. The **Connecticut Department of Public Health** (DPH) announced in September that five human cases of West Nile virus (WNV) were reported in Connecticut in 2015, with four identified in **Bridgeport** and one in **Shelton.** WNV-positive mosquitoes were identified in 23 towns. "While the threat of virus transmission to people is subsiding, four human cases is an unusual number in one town, and we are closely monitoring the situation with the **Bridgeport Health Department** and the **Connecticut Agricultural Experiment Station**," said DPH infectious disease epidemiologist **Randall Nelson**.

RESEARCHERS FIND LINK BETWEEN GENDER AND TOBACCO. **Sherry McKee**, professor of psychiatry and lead researcher of **Yale's Specialized Center of Research**, along with **Philip H. Smith** of the **Yale School of Medicine**, CASE member and **Women's Health Research at Yale** Director **Carolyn M. Mazure,** Andrea H. Weinberger of Yeshiva University, and Mira Kaufman of Brown University, completed a study published October 7 in the journal *Nicotine and Tobacco Research* focusing on gender and tobacco. The study found that varenicline (marketed as Chantix) was 46% more effective in women than men after three months treatment, and 31% more effective at maintaining complete abstinence after six months. "While it's clear that sex differences in varenicline efficacy exist, we don't yet know why varenicline is particularly effective for women," McKee said, adding that sex differences in the nicotine receptor system in the brain may be a key factor.

STUDY EXAMINES PRESCRIPTION USE IN OLDER ADULTS. CASE member **Mary E. Tinetti** of the **Yale School of Medicine** published a study appearing in *BMJ* online Oct. 2 that found that nearly 40% of adults 65 years and older take at least five prescription medications, and noted that the benefits of drugs prescribed for a single condition are difficult to ascertain in the presence of multiple conditions and drugs. The drugs studied included beta-blockers; calcium channel blockers; clopidogrel; metformin; renin-angiotensin system (RAS) blockers; selective serotonin reuptake inhibitors (SSRIs) and selective serotonin norepinephrine reuptake inhibitors (SNRIs); statins; thiazide diuretics; and warfarin. "Medication regimens can be simplified by eliminating medications for conditions that are not likely to benefit the individual's outcome priority, such as improved symptoms, optimal physical or cognitive function, or simplified treatment regimens," said Tinetti.

High Technology

CT HOSPITALS MAKE 'BEST WIRED' LIST. This summer, Hospitals & Health Networks named **Bristol Hospital, Danbury Hospital, Hospital of Central Connecticut, Middlesex Hospital, Norwalk Hospital, St. Francis Care, William W. Backus Hospital** and **Yale New Haven Health System** to its 2015 list of the nation's "Most Wired" hospitals and health systems. The recognition is based on the 17th annual "Most Wired" survey released August 2015 by the American Hospital Association's Health Forum and the College of Healthcare Information Management Executives (CHIME). The survey studied how organizations leverage IT to improve infrastructure, business and administrative management, quality and safety, and clinical integration.

MARCUM 'TECH TOP 40' ANNOUNCED. On September 24, **Marcum LLP** and the **Connecticut Technology Council** announced the 2015 Marcum Tech Top 40, an annual awards program recognizing fastest growing technology companies in Connecticut. The overall 2015 winner is New Haven-based **Continuity**, creators of technology solutions that automate compliance management for financial institutions. Other 2015 category winners are: **Revolution Lighting Technologies Inc., FuelCell Energy, Alexion Pharmaceuticals, iSend**, and **Datto**.

UCONN CENTER DONATES 3D PRINTER TO NEW LONDON LIBRARY. On October 27, **UConn** announced the donation of a 3D Printer to the **New London** public library. The donation was made possible by **UConn's Small Business Development Center** through a partnership with the **Chamber of Commerce of Eastern Connecticut**. Library staff will be trained by the **UConn 3D Printing Club** and in turn, will offer classes on using the equipment

BIO-NMR CENTER TO OPEN AT UCONN MEDICAL CENTER. This December, the **National Bio-NMR Center,** a new data processing and analysis center, will open at the **UConn Medical Center** in Farmington. It will include a nuclear magnetic resonance (NMR) spectrometer, allowing researchers to see biological molecules at the atomic level. The new Center and its primary component, "NMRbox," provide software support for hundreds of NMR programs used in biomedical research such as drug discovery and structural biology. "Due to the complexity of data processing needed for bio-NMR, dozens of separate software packages from different sources are sometimes necessary. We're building the 'app store' for bio-NMR software—and all that software is free," says CASE member **Jeffrey Hoch**, director of the **Gregory P. Mullen NMR Structural Biology Facility** at **UConn Health** and head of the new Center. A $6.4 million grant from the National Institute for General Medical Sciences, part of the National Institutes of Health (NIH), will enable the Center to provide US investigators access to a single, downloadable package through a cloud-based platform.

Transportation

CT BUSES TO GET GPS TECHNOLOGY. With $7 million from the **State Bond Commission, CTDOT** announced that 500 CTtransit buses would be equipped with GPS technology, allowing riders to track buses using smartphone apps. According to **Mike Sanders**, CTDOT's transit administrator, in the near future riders will not only be able to accurately track the schedule and timing of the buses, but using a password, will have access to bus locations.

MERRITT PARKWAY TO REMAIN UNALTERED. On September 12, it was announced that the $100 billion, 30-year transportation overhaul that includes widening several sections of I-95 and I-84, replacing a Hartford viaduct and the stacked "mixmaster" interchange in Waterbury, will not alter the **Merritt Parkway.** The state had proposed a new interchange with a local road and a recreation trail alongside the Parkway; however, the **Merritt Parkway Conservancy** opposed this plan because it would require removal of trees and construction of bridges over streams.

PEARL HARBOR BRIDGE OPENS EARLY. On September 28, the new **Pearl Harbor Memorial Bridge**, formerly known as the Q Bridge, located on I-95 in **New Haven**, opened eight months ahead of schedule. The four new lanes of the bridge will provide commuters traffic congestion relief. The bridge reconstruction is considered one of the largest projects in **CTDOT** history.

—Compiled and edited by Wendy Swift

NAS *(from page 1)*

◆ Optimizing US Investment in Academic Research

Research universities are critical contributors to our national research enterprise. They are the principal source of a world-class labor force and fundamental discoveries that enhance our lives and the lives of others around the world. They help to create an educated citizenry capable of making informed and crucial choices as participants in a democratic society. However many are concerned that the unintended cumulative effect of federal regulations undercuts the productivity of the research enterprise and diminishes the return on the federal investment in research for the benefit of the American people.

A new, congressionally mandated report from the National Academies of Sciences, Engineering, and Medicine, *Optimizing the Nation's Investment in Academic Research*, reviews the regulatory framework as it currently exists, considers specific regulations that have placed undue and often unanticipated burdens on the research enterprise, and reassesses the process by which these regulations are created, reviewed, and retired. The report identifies specific actions Congress, the White House, federal agencies, and research institutions should take to reduce the regulatory burden. Additionally, it suggests steps that should be taken to strengthen the nation's government-university research partnership, which is currently under stress, and urges Congress to create a public-private Research Policy Board to support this partnership and cooperative efforts to streamline research policies going forward. The report also calls upon universities to demand the highest standards in institutional and individual behavior, noting that some institutions have failed to respond appropriately to researchers' transgressions.

http://www.nap.edu/catalog/21803/optimizing-the-nations-investment-in-academic-research-a-new-regulatory

◆ Water-Energy Nexus Critical to Economic Security

Adequate water and energy are critical to the continued economic security of the United States. The relationship between energy and water is complex, and the scientific community is increasingly recognizing the importance of better understanding the linkages between these two resource domains. Federal agencies, the private sector, and academic researchers have noted that the lack of data on energy-water linkages remains a key limitation to fully characterizing the scope of this issue. Beginning in June 2013, the National Academies' Roundtable on Science and Technology for Sustainability, in collaboration with the Board on Energy and Environmental Systems and the Water Science and Technology Board, held four related meetings as part of a yearlong initiative focused on examining core water-energy nexus issues, including: primary linkages and trade-offs between increasing energy demands and production, and related water supply implications and water quality goals; criteria and a framework(s) for evaluating energy-water linkages and trade-offs; available technologies and strategies, and barriers, for balancing increasing energy demands with increasing water supply demands and water quality goals and concerns; and available public and private sector funds for leveraging further technological development, innovations, and research to address core energy-water nexus issues and trade-offs. A new report, *Addressing the Energy-Water Nexus,* summarizes the presentations and discussions from these meetings.

http://www.nae.edu/147064.aspx

◆ Getting it Right: Improving Diagnosis in Health Care

Most people will experience at least one diagnostic error—an inaccurate or delayed diagnosis—in their lifetime, sometimes with devastating consequences, according to a new report from the Institute of Medicine of the National Academies of Sciences, Engineering, and Medicine. The committee that conducted the study and wrote the report found that although getting the right diagnosis is a key aspect of health care, efforts to improve diagnosis and reduce diagnostic errors have been quite limited, and errors persist throughout all settings of care and continue to harm an unacceptable number of patients. The committee called for more effective teamwork among health care professionals, patients, and families; enhanced training for health care professionals; more emphasis on identifying and learning from diagnostic errors and near misses in clinical practice; a payment and care delivery environment that supports the diagnostic process; and a dedicated focus on new research.

http://www.nap.edu/catalog/21794/improving-diagnosis-in-health-care

The following Connecticut scientists were elected to the National Academies in 2015:

NATIONAL ACADEMY OF SCIENCES

Nancy Carrasco, MD
Professor of Cellular and Molecular Physiology
Yale University

Christine Jacobs-Wagner, PhD
William H. Fleming Professor of Molecular, Cellular, and Developmental Biology
Yale University

Robert J. Schoelkopf, PhD
Sterling Professor of Applied Physics and Physics
Yale University

NATIONAL ACADEMY OF MEDICINE

Ronald Duman, PhD
Elizabeth Mears and House Jameson Professor of Psychiatry
Director, Abraham Ribicoff Research Facilities
Yale School of Medicine and Connecticut Mental Health Center

Murat Günel, MD, FACS, FAHA
Chairman and Chief, Department of Neurosurgery
Nixdorff-German Professor of Neurosurgery
Yale School of Medicine and Yale New Haven Hospital

David A. McCormick, PhD
Dorys McConnell Duberg Professor of Neurobiology
Yale School of Medicine

Laura Niklason, MD, PhD
Professor and Vice Chair of Anesthesia and Biomedical Engineering
Yale University

Air Museum *(from page 1)*

turbojet that also powered the Boeing 707 jetliner, the B-52 bomber and the U-2 spy plane. Hamilton Sundstrand also created the life support systems in many of NASA's space suits and spacecraft. Two of these suits are on display along with other aerospace artifacts, many of which were also designed and built right here in Connecticut!

In 2016 NEAM will create two new mezzanine galleries offering elevated views of aircraft collections, while adding exciting new exhibits and visitor experiences.

NEAM's mission is to preserve and celebrate Connecticut aerospace history and to inspire the next generation of aviators and engineers through its exhibits and science curriculum-based educational programs that serve thousands of students in a number of school districts each year.

It is all about adventure, discovery, and the dream of flight!

Bulletin of the
Connecticut Academy of Science and Engineering
805 Brook Street, Building 4-CERC
Rocky Hill, CT 06067-3405

Winter Highway *(from page 1)*

The average number of winter season crashes with injuries for the seven years since and including 2006/2007 was 33.5% lower than for the seven prior years. The significance of the 2006/2007 season is that it was during that time that CTDOT decided to eliminate the use of sand as an abrasive and to transition to an anti-icing strategy. Anti-icing includes applying chemicals before and during a winter weather event. Liquid chemicals (CTDOT uses only liquid solution of sodium chloride) applied prior to a weather event is termed pre-treating. Pre-treating is effectively used to allow for melting of snow or ice immediately upon contact with the pavement surface. This inhibits adhesion to the pavement surface, and allows for easier removal by plows. It also prevents a buildup of packed snow and ice on the surface, thus reducing slippery surfaces during winter weather events. An added benefit of pre-treating is to alleviate formation of frost on bridges and road surfaces.

The elimination of the use of sand for winter maintenance by CTDOT has reduced the depletion of this natural resource by as much as 239,000 tons per year, or a total of 1.9 million tons over the past 8 years. Additionally, there was no longer the need to remove sand from the roadways each spring, which resulted in monetary savings, benefits to the environment, and a reduction in air pollution.

The study also found that CTDOT is not the only major player in winter maintenance in Connecticut. While CTDOT is responsible for 18% of the approximate 21,000 centerline miles of public roads, municipalities are responsible for the remaining 82% of mileage. From this study's survey of Connecticut municipalities, it was estimated that on average over the past five winters, CTDOT applied 153,000 tons of deicing chemicals per season compared to an estimated total of 350,000 tons of total salt (sodium chloride, magnesium chloride, and calcium chloride) per season applied by Connecticut's municipalities. In addition, there is a significant number of privately maintained business parking lots, shopping centers, malls, , driveways, and walkways in Connecticut that are estimated to utilize more than 50% of the chemical deicers applied. Therefore, winter maintenance is truly a shared responsibility that goes well beyond state and local government.

An informal survey done of state DOTs in New England, New York and New Jersey found that CTDOT's winter highway maintenance operations are consistent with the practices of these other states. CTDOT's total chloride tons applied per lane-mile ranks on the low end for chloride application—only Maine DOT and Vermont Agency of Transportation had lower application rates for total chlorides per lane-mile. However, because CTDOT proactively pre-wets nearly all solid sodium chloride with liquid magnesium chloride to keep it from bouncing off of the road, as well as for quick melting activation, this use of liquid magnesium chloride solution places Connecticut on the higher end of these liquid treatment applications relative to surrounding states.

The CASE report includes findings and recommendations for consideration by CTDOT and Connecticut's municipalities related to deicing chemicals and application techniques, infrastructure, vehicles, the environment, and outreach and education. The CASE study report can be accessed at http://www.ctcase.org/reports/index.html.

So when you find yourself out on the roadways during that next winter storm, consider the amount of effort that is required to provide the level of service that you expect. With the practice of winter maintenance constantly evolving, new approaches offer promise for improving Connecticut's winter road conditions, while reducing corrosion and environmental impacts. ***—James Mahoney and Donald Larsen, PE, Connecticut Transportation Institute at UConn***