



# Bulletin of the

## CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING

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### Cybersecurity: Implications and Prevention What Can We Learn from the NIST Framework?

With the world becoming increasingly networked, cybersecurity is a growing concern for individuals and businesses alike. Except for those few people living without dependence on critical infrastructure provided by government and industry, such as utilities, healthcare, transportation and defense, everyone is vulnerable to a cyberattack.

Motives for cyberattacks vary, from corporate and international espionage to activism, and criminal theft of identity or money.

The methods vary even more. Hackers exploit weaknesses in networked systems with tools such as worms, viruses, Trojan horses, Botnets and distributed denial of service attacks. E-mail scams, phishing and web-based attacks take advantage of unwary users. Some hackers embed malicious codes in hardware components during manufacture that they can later exploit. Others attach a skimming apparatus to the equipment that is used to swipe credit or ATM cards. Skilled hackers have even successfully physically destroyed equipment over the network. The most unlikely scenario, but one with a high impact, is that an electromagnetic pulse (EMP) device would render useless anything that has

unprotected circuits in it within the range of the device blast.

In 2013, President Obama issued an executive order, "Improving Critical Infrastructure Cybersecurity," which commissioned the National Institute of Standards and Technology (NIST) to "work with stakeholders to develop a voluntary framework, based on existing standards, guidelines, and practices, for reducing cyber risks to critical infrastructure." The framework debuted in 2014 and its core considerations are to identify, protect, detect, respond and recover.

According to Mark Raymond, the chief information officer of Connecticut's Bureau of Enterprise System Technology in the Department of Administrative Services, Connecticut uses the NIST Framework for all of the state agencies that have federal oversight or regulation, and all cyber-risk auditing they do is based on the NIST Framework controls. For the non-regulated agencies, the state uses the 20 critical controls of the SANS Institute, "which incorporates some of the controls within the NIST Framework, but doesn't go to the same extent," Raymond said.

(See *Cybersecurity*, page 2)

### 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](http://www.national-academies.org)).

#### ◆ 'Gene-Drive' Organisms Not Ready for Release

A new report from the National Academies of Sciences, Engineering and Medicine finds that while the emerging science of gene drives has the potential to address environmental and public health challenges, gene-drive modified organisms are not ready to be released into the environment. The report calls for more research in laboratories and highly controlled field trials and recommends a "collaborative, multidisciplinary, and cautionary approach to research on and governance of gene drive technologies." Gene drives are systems of biased inheritance that enhance a genetic element's ability to pass from parent organism to offspring. With the advent of new, more efficient, and targeted gene-editing techniques, gene modifications can, in principle, be spread throughout a population of living organisms intentionally and quickly via a gene drive, circumventing traditional rules of inheritance and greatly increasing

(See *NAS*, page 7)

### SoundWaters' Science Stars: All Girls, All Science, All Week



SoundWaters Science Stars during a population study of shallow water species in Long Island Sound. [Photo credit: Michael Bagley Photography]

School vacation usually means sleeping late and no school work, but not for 84 Stamford girls in grades 4 through 7 who spend their April vacation at SoundWaters with the Science Stars Program. These girls are immersed in science experiments and activities every day from 9am to 4pm.

Since 2007, more than 400 girls have participated in Science Stars. The program's target audience is underserved girls, who comprise 90% of the participants, and it has grown to be one of SoundWaters most sought-after programs. Funding support for Science Stars comes from Xerox, People's United Bank, Purdue Pharma and PepsiCo.

Through experimentation, inquiry, analysis, and presentations by women in STEM careers, Science Stars introduces girls to the possibility and potential of STEM education and careers. The curriculum encourages their interests in the sciences and

(See *SoundWaters*, page 7)

Although the original scope of the NIST Cybersecurity Framework is intended for critical infrastructure, its flexible and customizable nature makes it useful for almost any organization. NIST Senior Information Technology Policy Advisor Adam Sedgewick explained that, because “no two companies are alike,” the NIST Framework needs to be “a structure that could work for large, small, international, and regional companies, in all sectors, [which is] very challenging.” Sedgewick said the fact that the NIST Framework “is lightweight and agnostic to what type of company you are makes it valuable.”

Sedgewick said a major role for the NIST Framework team is to convene stakeholders and facilitate the sharing of best practices between users as well as feedback about their experiences using the Framework. Some users have created publicly available guides and tools for using the Framework. Additionally, a 2016 review produced a report called Cybersecurity Framework Feedback: What We Heard and Next Steps. The review was mostly positive and only a few minor updates will be made to the Framework as a result of it.

The openness of the NIST Framework processes is somewhat unique because companies often are reluctant to disclose that they have been compromised, and much of the information is protected by law.

Connecticut also practices openness, Raymond said. “In addition to participating in the information sharing through the Multi-State Information Sharing and Analysis Center (MS-ISAC), Emergency Management Deputy Commissioner and state Homeland Security

Advisor William Shea and I co-chair a cybersecurity task force whose membership includes a diverse mix of stakeholders, including higher education, law enforcement, public utilities, private businesses and others. We meet regularly to discuss the latest threat and vulnerability information because we know that information sharing is key to cultivating a culture of information security and is a best practice to which states should conform.”

Raymond said that the task force “does not restrict anyone from joining the group, but we operate under a Non-Disclosure Agreement. We share information that is considered for official use only... [but] can be disseminated to anyone who has a ‘need to know.’” He added that the task force builds relationships between institutions that could be helpful should a cyberattack occur.

Frank Breitinger, assistant professor and co-director of the Cyber Forensics Research and Education Group at the University of New Haven (UNHcFREG), noted that open disclosure will greatly assist those working to prevent and defend against cyberattacks of all varieties.

Breitinger said, “We need to get people in the mindset that security is important. People need to talk about it, and once people do, it will become more popular and people will want to study it” to find secure solutions for prevention, detection and recovery.

Even with access to cyberattack data, Breitinger said, it is still challenging to trace the origin of such attacks, which are usually orchestrated by expert hackers. This makes it difficult to hold individuals, groups or nations accountable for their offenses, and the lack of ability to retaliate makes it difficult to deter future attacks.

The NIST review found it difficult for an organization to measure its success in cyber-risk management. In response, NIST agreed to create self-assessment criteria. The review also suggested that third-party auditors and consultants review the security efforts of the organization.

According to Sedgewick, existing standards and frameworks have been built into the NIST Framework considerations, but meeting regulatory requirements does not necessarily equate to true risk management.

Joel Gordes, an independent energy policy expert with the Center for Energy Security Solutions, sees issues with both under- and over-regulation. Having no standards can lead to variations in security between larger and smaller companies because standards are expensive to implement. But with too many standards, smaller companies may choose to implement standards that may be outdated or incomplete instead of doing what is really needed to make their systems less vulnerable.

The NIST Framework addresses such concerns by creating voluntary and flexible guidelines for each company to follow in creating its own risk management plans, according to its own unique needs.

Gordes is particularly concerned about the vulnerability of the electrical grid to cyberattack. The system is tightly coupled, centralized and complex, both physically and via the network, and an issue in one part of the grid can quickly cascade and end up affecting a large area. The equipment within the grid is often old and components are challenging and time-consuming to replace. Consequences of grid failure include the inaccessibility of other critical infrastructure sectors, leading to a lack of available life-essential resources.

Gordes is concerned that the more interconnected the system gets,

### The Connecticut Academy of Science and Engineering

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# IN BRIEF

## Science and Engineering Notes from Around Connecticut



### Biomedical Research

**LIN NAMED EUGENE HIGGINS PROFESSOR.** CASE member **Haifan Lin**, who directs the **Yale Stem Cell Center**, an incubator for scientific discovery and training for new researchers, was recently named Eugene Higgins Professor of Cell Biology at Yale. Lin's work is focused on the self-renewing mechanism of stem cells and germline development and cancers related to the malignant proliferation of stem cells. His research has been recognized with the David and Lucile Packard Fellowship for Science and Engineering, the Laura Hartenbaum Breast Cancer Foundation's Legacy for Hope Award, the National Institutes of Health Director's Pioneer Award, the Ray Wu Award, and the Society for the Study of Reproduction Research Award.

**JOHN DEMPSEY HOSPITAL EXPANDS WITH NEW TOWER.** On May 13, **John Dempsey Hospital** opened its new, eleven-floor, 38,000-square foot hospital tower in Farmington, relocating seventy patients on five floors, including those in intensive care. The tower includes 169 private rooms, a surgical unit, the hospital's oncology unit, cardiac step-down units, and a 40-bed emergency department. It was completed with funding from the state's **Bioscience Connecticut** initiative. Labor and delivery, gynecology, prisoner-care and psychiatric inpatient units remain in the pre-existing tower.

**UCONN JOINS NATIONAL MICROBIOME INITIATIVE.** The **University of Connecticut** will invest \$225,000, in partnership with the Small World Initiative, in an interdisciplinary research and education program, to identify new antibiotics as part of the White House's \$121 million **National Microbiome Initiative**. Dysfunctional microbiomes are associated with chronic diseases such as obesity, diabetes, and asthma; local ecological disruptions such as the hypoxic zone in the Gulf of Mexico; and reductions in agricultural productivity. The National Microbiome Initiative strives to enhance microbiome understanding through three main goals: supporting interdisciplinary research, developing platform technologies to improve access to microbiome data, and expanding the microbiome workforce.

**STEITZ AWARDED KRAFT PRIZE FOR CANCER RESEARCH.** On June 1, it was announced that CASE member **Joan A. Steitz**, Sterling Professor of Molecular Biophysics and Biochemistry at the **Yale School of Medicine**, was the recipient of the 2016 Jonathan Kraft Prize for Excellence in Cancer Research. The award celebrates achievements in cancer research and is endowed by Robert Kraft, owner of the New England Patriots, in honor of his son. Steitz was awarded the National Medal of Science in 1986 and the Connecticut Medal of Science in 2015.

**JACKSON LAB'S BANCHEREAU RECEIVES \$3.4M GRANT.** This June, the National Institute of Allergy and Infectious Diseases awarded CASE member **Jacques Banchereau**, **Jackson Laboratory** professor and director of immunological sciences, a grant totaling \$3.4 million over five years to develop new adjuvants to boost vaccine effectiveness for protecting elderly and immunosuppressed patients. Adjuvants are components of vaccines added to boost the immune response. Banchereau notes that "few adjuvants have been proven safe and effective for use in humans. This new funding will allow us to screen new combinations of adjuvants in human immune cells and to investigate their mechanisms of action, with the ultimate goal of discovering new combinations that boost the efficacy of vaccines and lead to new vaccine development."

**NEW SCAN TECHNIQUE HOLDS PROMISE FOR MONITORING ALZHEIMER'S.** CASE member **Richard Carson**, Yale professor of radiology and biomedical imaging, along with other Yale researchers, has developed a brain-scanning technique that combines PET scanning with a radioactive tracer to measure the density of nerve synapses for monitoring Alzheimer's disease while patients are living. The technique may also help diagnose epilepsy and other disorders and provide insight for improved treatment. Loss of synaptic density also occurs in patients with schizophrenia, depression, and Parkinson's disease. The technique opens the way for researchers to study how medications work to slow neuron loss. The study was published July 20 in *Science Translational Medicine*.

**YALE CTSA FUNDING RENEWED.** On July 25, the National Center for Advancing Translational Sciences (NCATS) awarded the **Yale School of Medicine** (YSM) \$53.6 million to renew its five-year Clinical and Translational Science Award (CTSA). "We've made incredible strides under the CTSA in establishing a robust infrastructure and resources for investigators," said CASE member **Robert J. Alpern**, dean of YSM and the Ensign Professor of Medicine. CASE member and C.N.H. Long Professor of Medicine **Robert S. Sherwin** is the principal investigator of the CTSA.



### Business & Industry

**EUROPEAN AGENCY CERTIFIES P&W ENGINE.** On May 23, **Pratt & Whitney (P&W)** announced its PurePower® Geared Turbofan™ PW1500G engine received certification from the European Aviation Safety Agency. The engine is used to power the Bombardier C Series aircraft family. The certification allows P&W to deliver PW1500G engines to Swiss Air. The Federal Aviation Administration certified the P&W PurePower PW1400G-JM engine to power airframe builder Irkut Corp.'s MC-21 aircraft.

**FDA APPROVES 'BONE HARVESTER.'** **Avitus Orthopaedics**, part of **UConn's Technology Incubation Program** in Farmington, in June earned FDA approval for its Bone Harvester, a device that collects bone marrow and bone graft material without the need for a large incision. UConn's program, which started in 2003, has helped over 75 start-ups improve their chances for success.

**WORKFORCE BOARD RECEIVES \$4M FOR TRAINING.** The **Northwest Regional Workforce Investment Board** will receive \$4 million from the US Department of Labor for its ITXpress Program to support training of 400 people for jobs in information technology throughout Connecticut. The program may include "boot camp" training, internships, apprenticeships, mentoring, transportation and child care assistance, as well as follow-up support to help participants get employment.

**BOND AGENCY APPROVES \$1.3M FOR DAVIS-STANDARD.** The **Connecticut Bond Commission** has approved \$1.3 million to help fund a 15,045-square-foot addition to allow Pawcatuck-based **Davis-Standard**, the nation's largest extrusion machinery manufacturer, to house blown-film manufacturing equipment from Gloucester Engineering Co., a Gloucester, Massachusetts, company that Davis-Standard acquired last fall. The addition will create more than 30 jobs in the next two years.

**UTC VP NAMED TO DOD INNOVATION BOARD.** A new Defense Innovation Advisory Board was established by Defense Secretary

*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](mailto:acad@ctcase.org).*

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Ashton B. Carter in March "in an effort to enhance the Defense Department's culture, organization and processes by tapping innovators from the private sector in Silicon Valley and beyond," according to Pentagon officials. The Board comprises fifteen members, including CASE member and **United Technologies'** senior vice president for science and technology, **J. Michael McQuade**. On July 26, the Department of Defense opened an East Coast "innovation hub" for its Defense Innovation Unit Experimental (DIUX) in Cambridge, Massachusetts; the new office joins one opened last year in Silicon Valley.

### Communication

**FRONTIER TO USE GPON TECHNOLOGY IN HARTFORD'S NORTH END.** **Frontier Communications** recently announced plans to increase speeds and deploy additional fiber technology to both businesses and residential subscribers in Hartford's north end, using Gigabyte Passive Optical Network (GPON) technology.

**STANLEY NAMED UCONN CMIO.** **UConn Health** has named **Dirk Stanley** as its first chief medical information officer (CMIO), tasked to manage an electronic medical record (EMR) implementation project that began this summer. The EMR implementation focuses on unifying UConn Health under a single EMR tool to support patient safety and quality of care.

**NEW TV STUDIO TO PRODUCE HEALTH PROGRAMMING.** **Hartford HealthCare** recently built a \$35,000 TV studio at its **Newington** offices to produce in-house, multi-camera programming to air on local news stations and be distributed through social media and other channels. Its first 30-minute special, "Hope After Heroin: Stories of Recovery," filmed using four high-definition cameras, high-end switching equipment, computer monitors, a teleprompter and a soft purple, backlit set, was broadcast in early June on **NBC Connecticut/WVIT**. The Newington studio is Hartford HealthCare's second production facility; a smaller studio was built in 2012 at **Hartford Hospital**.

### Education & Cognition

**CT STUDENTS HONORED AT I-SWEEP.** From April 27-May 1, students representing 62 countries traveled to Houston to participate in the 9th Annual International Sustainable World (Energy, Engineering & Environment) Project Olympiad (I-SWEEP). Thirteen students who competed in the 2016 **Connecticut Science and Engineering Fair (CSEF)** competed, and ten were recognized for their projects, earning gold, silver and bronze medals. **Maya Geradi**, a junior at New Haven's **Wilbur Cross High School**, received a Gold Medal in the Environment-Pollution & Management category. Maya was CSEF's Urban School Challenge High School 1st Place Winner. For that accomplishment, she was also awarded a 2016 **H. Joseph Gerber Medal of Excellence**, a CASE award presented in partnership with the **Connecticut Center for Advanced Technology**. **William Yin** from **Greenwich High School** was an overall winner, and was awarded an expense-paid trip to the Stockholm International Youth Science Seminar (SIYSS), where he will also attend the Nobel Prize Ceremonies.

**QUINNIPAC TO OPEN ENGINEERING SCHOOL.** Quinnipiac University will open a new **School of Engineering** this fall with **Justin W. Kile** serving as founding dean. Programs will include civil, industrial, mechanical, and software engineering lead-

ing to bachelor of science degrees, in addition to a bachelor's degree program in computer science. Until now, engineering courses have been offered by **Quinnipiac's School of Business and Engineering**.

**CT STUDENTS WIN INTEL AWARDS.** Winners at the 2016 Intel International Science & Engineering Fair (ISEF) were announced this May, and of the 1,700 competitors from over 75 countries, five Connecticut students won awards totaling over \$7,000. The student delegation, along with the **Connecticut Science & Engineering Fair (CSEF)** director and CASE member **Bob Wisner**, traveled to Phoenix for the fair.

### Energy

**CMEEC TO DEVELOP SOLAR ENERGY, STORAGE SYSTEMS.** The **Connecticut Municipal Electric Energy Cooperative (CMEEC)**, SolarCity and Massachusetts-based Brightfields Development recently announced development of 13 solar power systems and 1.5 megawatts of energy storage systems located in southern Connecticut. SolarCity and its partner, Brightfields, began work on 57,000 panels located in **Bozrah, Norwich** and **Groton**. The solar power systems are located on lands that are underutilized or no longer in use for agriculture. CMEEC will use the solar and stored energy generated by the systems to provide a cleaner and more resilient power infrastructure for its municipal utility members and wholesale electric customers. The project is expected to be completed by December 2016.

**UCONN TEAM DEVELOPS NEW CATALYST FOR HYDROGEN CAPTURE.** **UConn** chemists led by CASE members and professors **Steven Suib** and **James Rusling** have developed a metal-free catalyst to make hydrogen capture more commercially viable and provide a key element for a new generation of less expensive, lightweight hydrogen fuel cells. According to Suib, manipulating the sulfur and carbon atoms to create stable bonds and structures within the nanotubes, while also maintaining or improving the tubes' electrochemical potential so that it mirrors that found in the rare metals, was the key to the success of the new process.

**YALE TEAM SCORES TOWNS ON SOLAR PV.** Yale researchers from the **Yale Data-Driven Environmental Solutions Group** released a series of scorecards evaluating Connecticut municipalities in terms of installed solar capacity, permitting processes, community engagement, and availability of information for residential solar photovoltaic (PV) deployment. Connecticut provides incentives for residential solar PV in an effort to achieve up to 300 megawatts of deployed solar by 2022. The scorecards highlight municipalities helping the state meet this target. Out of Connecticut's 169 municipalities, **Coventry, Ashford, Mansfield, Simsbury** and **Windsor** lead the state in municipal support for residential solar PV.

**BLOOMFIELD SOLAR PROJECT LARGEST YET FOR GREEN BANK.** In July, Connecticut's **Green Bank** completed financing for its largest solar project to date, for Bloomfield-based **Lesro Industries**. Lesro, which manufactures institutional furniture for places like nursing homes, is among the highest energy users in Connecticut. It is expected that 3,200 rooftop solar panels installed on the roof of the company's 268,000 square foot headquarters will save over \$30,000 a year in energy costs and greatly reduce the company's carbon footprint.

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### Environment

#### CT HONEYBEE DIE-OFF HIGHER THAN NATIONAL AVERAGE.

According to the recent national survey by the Bee Informed Partnership, Connecticut beekeepers lost nearly half their honeybees during the summer and winter of 2015-16, a die-off rate higher than the national average of 44%. Scientists agree these death rates result from poor bee nutrition due to loss of habitat, disease, and pesticides. The **Connecticut General Assembly** adopted legislation in 2016 to help bees and pollinators, including restricting some pesticides and planting pollinator-friendly flowers and bushes along state highways. The new law calls for scientists at the **Connecticut Agricultural Experiment Station** to develop a "best practices" plan to direct the **Connecticut Department of Transportation's** pollinator plantings and improve beekeeping procedures.

**CO<sub>2</sub> EMISSIONS RISE.** A recent study by the nonprofit Acadia Center noted that carbon dioxide emissions from Connecticut sources rose by about 4.4% over 2013 and 2014 levels. The previous eight years had seen repeated declines in the state's CO<sub>2</sub> emissions. The CO<sub>2</sub> pollution increase may be based on an improvement in the economy, lower fuel prices, and weather variations. Acadia experts warned that "preliminary data for 2015 suggests emissions for this past year will be higher than the level for 2014."

**GREENWICH HOME TO NEWEST GREEN LEAF SCHOOLS.** This spring, two Greenwich schools—the **Stanwich School** and the **Putnam Indian Field School**—were recognized as Connecticut's newest Green LEAF Schools. Schools are recognized for providing effective environmental and sustainability education, improving health and wellness of students and staff, and reducing environmental impact and cost.

**DEEP SEEKS EPA ACTION ON EMISSIONS.** Connecticut **Department of Energy and Environmental Protection Commissioner Robert Klee** has asked the US Environmental Protection Agency to require that the Brunner Island Steam Electric Station in York County, Pennsylvania, reduce pollution from its three coal-fired power plants, citing concerns that the plants' emissions contribute to Connecticut having the highest ozone levels in the Northeast.

**DEEP, AUDUBON NAMES NEW 'IPA' SITES.** Connecticut's **Department of Energy and Environmental Protection** identified five IPA (Important Bird Area) sites of particular importance for conserving imperiled bird species in Connecticut. The five sites include: mouth of the **Connecticut River**, **Lyme Forest Block**, **Macedonia Forest Block**, **Meshomasic Forest Block** and **Miles Wildlife Sanctuary** and **Housatonic State Forest Block**.



### Food & Agriculture

**ANTIBIOTIC USE LEADING TO 'SUPER BUGS.'** In April, the journal *Pharmacotherapy* issued a report warning that the overuse of antibiotics in agriculture contributes to increasing "super bugs," strains of bacteria resistant to traditional medical treatment.

**Michael Nailor**, UConn School of Pharmacy professor and Hartford Hospital infectious disease pharmacist, noted that agricultural use of antibiotics in the United States increased by 20% between 2009 and 2013. According to **Michael Darre**, professor and poultry specialist at UConn, federal regulations created last year will drastically cut antibiotics used in feed for chickens, cattle and hogs.

**INDOOR FARM SLATED FOR BRIDGEPORT.** Green Collar Foods (GCF), a Controlled Environment Agriculture business, announced it will partner with **Pivot Community Development Corporation** to build an indoor farm in **Bridgeport**. The facility will grow kale, arugula and cilantro for sale to local institutions and retailers interested in using local suppliers. GCF's mission is to support inner-city farmers growing quality food.

**YOUNG FARMERS ON THE RISE.** Members of Connecticut's congressional delegation met with state legislators and agriculture officials to discuss the current status of farming in Connecticut in June. They learned that, according to the 2012 Agriculture Census (the latest available statistics), there are 1,381 "beginning farmers" in Connecticut (operating less than 10 years). In addition, between 2007 and 2012, the number of farmers under the age of 25 in the state grew by 129%, with the number between the ages of 25-34 rising by 40%. In addition, there was a 29% increase in farms principally operated by women between 2002 and 2012, and the number of vegetable farms increased 61%. The US Senate Appropriations Committee recently passed a bill that included \$34 million for federal programs to assist beginning farmers, including money for the **Beginning Farmer and Rancher Development Program** being run by **UConn** through its extension program.

**STATE TO ENFORCE 'CONNECTICUT GROWN.'** A new Connecticut law requires that only products grown or produced in Connecticut may be advertised or sold as "Connecticut Grown." To help ensure the law is enforced, the **Connecticut Department of Agriculture** conducted surprise inspections at farmers' markets this summer. The law requires anyone selling a farm product identified as "Connecticut Grown" at a farmers' market to do so in the "immediate proximity" of a sign that identifies the product as such and discloses the name and address of the person or business that grew or produced it.



### Health

**ZIKA TESTING UNDERWAY.** On June 1, **The Connecticut Agricultural Experiment Station** began state-wide trapping and testing of mosquitoes for mosquito-borne viruses that cause human disease including the Zika virus. Thus far, 49 human cases of Zika have been reported in Connecticut, all travel related. Potential local transmission by mosquitoes is being closely monitored through enhanced trapping and testing of the Asian tiger mosquito, *Aedes albopictus*, the only competent mosquito vector known to occur in the state. It is an aggressive human biter which has been detected in several communities located in coastal **Fairfield** and **New Haven Counties**.

#### NEW LAW ALLOWS MEDICAL MARIJUANA FOR MINORS.

Governor **Dannel Malloy** has signed Public Act 16-23, a bill allowing minors with certain medical conditions to access Connecticut's medical marijuana program. The measure, to take effect starting October 1, provides treatment to minors with one of five conditions: a terminal illness requiring end-of-life care; cystic fibrosis; cerebral palsy; severe epilepsy or uncontrolled intractable seizure disorder; or an irreversible spinal cord injury with objective neurological indication of intractable spasticity, provided permission from a parent or guardian and two physicians is granted.

**NEW BRITAIN RECEIVES \$3.4M FOR LEAD ABATEMENT.** New Britain has been awarded a \$3.4 million federal Housing and Urban Development grant to reduce lead hazards in 184 housing units, making housing units safer for low- and very low-income families. According to the nonprofit **Connecticut Health**

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**Investigative Team**, almost 60,000 Connecticut children under age 6 were reported with lead exposure in 2013, with 2,275 children having levels high enough to be considered poisoned. Health experts believe rates are higher than these reported because of gaps in state-mandated testing. Nearly 75% of housing in Connecticut was built before 1980, creating a greater likelihood of lead in paint and old pipes.

**UCONN'S PESCATELLO NAMED TO HHS PANEL.** On June 29, the US Department of Health and Human Services assistant secretary for health announced the appointment of 17 nationally recognized experts in physical activity and health to serve on the 2018 Physical Activity Guidelines Advisory Committee. Among those experts is CASE member **Linda Pescatello, University of Connecticut Distinguished Professor of Kinesiology and Department of Community Medicine and Health Care, UConn School of Medicine**. The Committee is responsible for reviewing scientific evidence on the relationship between physical activity and health outcomes to create evidence-based recommendations for health professionals and policymakers on how children and adults can improve health through physical activity.



### High Technology

**NEW INNOVATION INSTITUTE LAUNCHED.** UConn has announced plans to participate in the US Department of Energy's Smart Manufacturing Innovation Institute, to be established with a \$70 million federal award. The purpose of the Institute is to fuel growth and innovation nationwide, with more than \$140 million in public-private investment geared toward developing advanced manufacturing technology and a supporting workforce and education pipeline. The **United Technologies Corporation Institute for Advanced Systems Engineering**, a UConn Tech Park member, will lead the Institute activities in Connecticut, along with the **Connecticut Center for Advanced Technologies (CCAT)** and the **United Technologies Research Center**. CCAT will house a smart manufacturing testing ground in East Hartford to demonstrate technology application, with participating businesses receiving smart manufacturing training. **Kazem Kazerounian**, CASE member and dean of the **UConn School of Engineering** notes, "By pairing our faculty with industry partners in the collaborative Tech Park environment, we can help Connecticut manufacturers to improve their processes and become even more competitive in the global economy."

**YALE TEAM CROSSES 'BREAK EVEN' POINT IN QUANTUM DATA.** Yale scientists, led by **Robert Schoelkopf**, CASE member and Sterling Professor of Applied Physics and Physics, director of the **Yale Quantum Institute**, and principal investigator of the study, have created a system to encode, spot errors, decode, and correct errors in a qubit, crossing the "break even" point in preserving quantum information beyond the lifetime of its constituent parts. The researchers devised a microwave cavity with an even number of photons in a quantum state. If a photon is lost, there will now be an odd number, allowing scientists to measure the parity and detect errors without disturbing the qubit. This technique extends quantum bit life over three times longer than typical superconducting qubits today. The research was reported in the July 20 issue of the journal *Nature*.

**STATE COMPLETES ORTHOIMAGING PROJECT.** With the help of the Sanborn Map Company, the state of Connecticut has completed an orthoimaging project—an aerial method of photographing the state to provide Connecticut with its first statewide acquisition of datasets with a high level of accuracy. The product combines

the characteristics of a photograph with the geometric qualities of a map in order to obtain direct measurements of distances, areas, angles, and positions. The results will be publicly available through the state's Open Data Initiative.

**UTRC ANNOUNCES BREAKTHROUGH IN VEHICLE NATURAL GAS STORAGE.** Engineers at the **United Technologies Research Center (UTRC)** recently announced development of the first commercially viable natural gas storage tank for vehicles, an advance that could reduce greenhouse gas emissions. The tank is flexible in size, flat and stackable, allowing it to be placed under a pickup truck bed or car trunk, using less space and storing more gas than traditional metal-cylinder tanks. UTRC licensed the tank technology to Adsorbed Natural Gas Products Inc. of Chester, New Jersey, to develop and produce the tanks. UTRC began developing the technology in late 2012, said CASE member **David Parekh**, corporate vice president of research and director at UTRC.



### Transportation

**BOND AGENCY OKAYS \$120M FOR TRANSPORTATION PROJECTS.** On July 11, Connecticut's bond commission voted to authorize \$119.8 million to finance various transportation-related improvements and other related costs as part of its transportation infrastructure program. The **Connecticut Department of Transportation** is also seeking \$30 million for grants to municipalities as part of the Town Aid Road grants-in-aid for fiscal year 2016-2017. A total of \$60 million was approved in the state budget. Other funding includes \$16.2 million towards I-95 improvements and the replacement of traffic lights in **Middletown** on Route 9.

**Q BRIDGE GETS INNOVATION AWARD.** On June 7, the **Pearl Harbor Memorial Bridge** ("Q Bridge") was awarded the Best Use of Innovation by the Northeast Association of State Transportation Officials. The competition, which is sponsored by the American Association of State Highway and Transportation Officials, the AAA motor club and the US Chamber of Commerce, recognizes the best transportation projects in the categories of Quality of Life/Community Development, Best Use of Innovation, and Under Budget. The 4,200-foot-bridge crosses the **Quinnipiac River** and connects with I-95, I-91 and Route 34. It will be used daily by 140,000 vehicles.

### CT HIGHWAYS RANKED AMONG BUSIEST IN NATION.

According to the June 27 report from TRIP, a national transportation research group, **Connecticut's** highways have the third highest rate of vehicle travel per lane mile, making them among the busiest and most congested in the nation. Connecticut also has the eighth most congested Interstate highways, with at least 60% of Connecticut's urban Interstate highways experiencing congestion during peak travel hours. Fourteen percent of Connecticut's interstate highways are in poor or mediocre condition, 7% of the state's interstate bridges are structurally deficient—the fifth highest rate in the nation—and 19% are functionally obsolete.

**DMV BEGINS OPERATIONS REVIEW.** On July 18, the **Connecticut Department of Motor Vehicles (DMV)** began review of operations to improve customer service and limit wait times. An outside contractor was hired to streamline passenger vehicle registrations, simplify commercial vehicle registrations, and eliminate unnecessary steps to register boats. The department chose a licensing vendor, MorphoTrust USA, because of the association between the licensing system and other DMV operations.

— Compiled and edited by Wendy Swift

## From the National Academies (from page 1)

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the odds that an altered gene spreads throughout a population. For example, gene drives might be developed to modify organisms that carry infectious diseases such as dengue, malaria, and Zika. In agriculture, a gene drive might be used to control or alter organisms that damage crops or carry crop disease. On the other hand, some gene-drive modified organisms might lead to unintended consequences, such as the unintentional disruption of a non-target species or the establishment of a second, more resilient invasive species.

<http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=23405>

### ◆ Lessons from the Corrosion Crisis in Flint: A More Proactive Approach to Technology Stewardship

The water contamination crisis in Flint, Michigan, demonstrates that the current approach to technology stewardship in the face of problems that may lead to calamity is not working. The author of "The Corrosion Crisis in Flint, Michigan: A Call for Improvements in Technology," in the summer issue of the National Academy of Engineering's *The Bridge*, urges a more proactive approach to technology stewardship, risk assessment, and public policy practice, drawing on lessons from previous experiences and supporting timely, data-driven decisions and actions by well-informed authorities. Without such cultural and behavioral change, the author cautions, there is the risk of repeating technological mistakes and encountering disasters again and again, with enormous costs in public health and public trust and at great taxpayer expense.

<https://www.nae.edu/Publications/Bridge/155266/155382.aspx>

### ◆ Report Urges Congress To Create Commission to Review Protection of Human Participants in Research

A new report from the National Academies of Sciences, Engineering, and Medicine that examines the regulations governing federally funded research recommends that Congress authorize and the president appoint an independent national commission to examine and update the ethical, legal, and institutional frameworks governing research involving human subjects. The commission should make recommendations for how the ethical principles governing human subjects research should be applied to unresolved questions and new research contexts. The report also calls for the executive branch to withdraw the Notice of Proposed Rulemaking for the "Common Rule" (formally known as the Federal Policy for Protection of Human Subjects) and recommends that the regulatory structure protecting human research subjects not be revised until the national commission has issued its recommendations and the research community, patient groups, and the public have had a chance to consider and react to them.

The report is the second part of a two-part study. Part 1, released in September 2015 and included in the new volume, concluded that continuing expansion of federal regulations on research is diminishing the effectiveness of the US research enterprise and recommended actions to reduce the regulatory burden. It also recommended the creation of a public-private Research Policy

Board to streamline research policies going forward.

<http://www.nap.edu/catalog/21824/optimizing-the-nations-investment-in-academic-research-a-new-regulatory>

### ◆ Support for Science May Not Always Translate into Support for Specific Issues

US adults perform comparably to adults in other economically developed countries on most measures of science knowledge and support science in general, according to a new report from the National Academies of Sciences, Engineering, and Medicine. However, attitudes toward some specific issues, such as climate change or genetic engineering, may be shaped by factors such as values and beliefs rather than knowledge of the science alone. Despite popular assumptions, research shows that increasing science literacy will not lead to appreciably greater support for science. The committee that conducted the study and wrote the report said that science knowledge is only one component of science literacy, which also encompasses understanding scientific practices, such as forming and testing hypotheses, and understanding science as a social process, such as the role of peer review. The report presents a research agenda with questions about creating new measures of science literacy and expanding the information available to clarify: 1) the relationship between science knowledge and attitudes toward science; 2) how science literacy is used and measured in different contexts; 3) the relationship of science literacy to other literacy skills; and 4) the role of science literacy for citizens as decision-makers.

<http://www.nap.edu/catalog/23595/science-literacy-concepts-contexts-and-consequences>

### ◆ 'Time has Come' for Direct User Charging for Roads

Increasing numbers of US roads and bridges are in unsatisfactory condition; these conditions, combined with shrinking funds for maintenance and repair, are cause for concern. For decades, the motor fuel tax, an indirect excise tax on the sale of fuel, has been the primary source of federal and state highway revenue in the United States. Federal and most state fuel tax rates have not changed for many years, and increasing fuel efficiency has created a serious funding gap that is rapidly increasing. The authors of "Charging Mechanisms for Road Use An Interface between Engineering and Public Policy" in the Summer 2016 issue of *The Bridge* from the National Academy of Engineering say the "time has come" to transition from the current indirect mechanism of road user charging to a direct mechanism, noting that it is only recently that the implementation of a direct mechanism has become technically and economically feasible. With direct user charging (DUC), the cost responsibilities of each vehicle class can be used as a guide to charge individual vehicles. If properly implemented, DUC will allow agencies to pursue public policy objectives related to congestion, emissions, travel demand management, environmental protection, and equity associated with road use.

<http://www.nap.edu/catalog/23595/science-literacy-concepts-contexts-and-consequences>

## SoundWaters (from page 1)

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fosters a greater sense of self at a critical time in their personal and academic development by improving confidence and independence to pursue their passions. Participating girls conduct a variety of indoor and outdoor science experiments focused on Long Island Sound, including: a horseshoe crab blood lab, water quality experiments, and hands-on live animal adaptation lessons. Science Stars gives these girls the chance to explore and pursue their individual interests and passions for science and technology, which studies have shown can have lasting effects on future academic and professional careers.

Founded in 1989, SoundWaters is the premier environmental education organization focused on the protection of Long Island

Sound and its watershed. Annually, SoundWaters hosts shipboard and land-based science programs for 28,000 children, including 9,000 from underserved communities.

SoundWaters works in partnership with individuals, schools, communities, businesses, civic organizations, and other environmental and educational organizations to develop experiences that foster a sense of responsibility for the environment and encourage actions that ensure the sustainable future of the Long Island Sound ecosystem. For more information, please visit [www.soundwaters.org](http://www.soundwaters.org).

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## Cybersecurity *(from page 2)*

including personal smart devices connected to the electrical grid, the more the potential cyberattack surface increases.

Breitinger explained, "Now our fridge is on the Internet; our air conditioning can be controlled by our smart phone. How many people are wearing smart watches, which may contain medical information, heart rate, and GPS locations? What happens when someone hacks my car?" He continued, noting that "a lot of companies want to jump on board with the 'Internet of Things' (IoT) but don't have the expertise [in designing for security]." In addition, security needs are constantly changing, and companies and users often are unable or unwilling to keep up with the updates that will allow for continued security.

Additionally, the recent switch from analog to digital equipment for the control of key processes in the electrical grid means that one cannot quickly restore power manually, as happened in Ukraine when their electrical grid was successfully hacked. "We cannot do that now," Gordes said. "We are digitized. It would take us significantly longer to recover in this country."

Gordes proposes that decentralization of the grid, with more diversity in generation sources that are closer to the end users, would make the grid less vulnerable and also make it easier to recover if an attack did occur.

In April 2016, the Public Utilities Regulatory Authority (PURA) of Connecticut released the Connecticut Public Utilities Cybersecurity Action Plan. The plan established a PURA Cybersecurity Oversight Program for utilities and suggested that each industry should choose

its own cybersecurity framework to follow, including the NIST Framework option.

Raymond said it is difficult to say how Connecticut compares to other states in cybersecurity preparedness. He noted that some states, such as Michigan, Virginia and Minnesota, are obvious leaders because they already "have a formalized cybersecurity strategy and are making investments in it," adding, "Connecticut is one of five states that were selected to participate in a year-long National Governor's Association Cybersecurity Policy Academy," which started early this summer. The result will be a finalized cyber disruption plan, a finalized cyber incident response plan, a finalized cybersecurity strategy and a report on Connecticut's readiness relating to cyber risk.

Ultimately, Breitinger said, "the major problem is not so much the technology itself. For instance, firewalls are usually pretty good and well tested for existing systems. The major problem is the human behind it. We do not educate the users. I can have the best security mechanisms in the world, but if I have a user who clicks on an E-mail and downloads a file... This [creates an opening into the system and] is more critical [to prevent]." He continued, "we need to spend a lot of money and time to educate the users on what is phishing, what are scams, etc."

Raymond agreed, saying "It is really important for people to understand that they are the line of defense, that technology can only go so far. People must understand the impact of what they are doing; what safe and unsafe behavior looks like." — **Victoria Misenti, freelance writer.**