

Bulletin *of the* CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING



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Astronomy and Astrophysics: Solving Critical Issues on Earth with the Science of the Universe

For many people, a look through a telescope or pictures of far-away galaxies can be enough to stir a passion for astronomy or astrophysics, the science that explains the physics of the universe and astronomical phenomena. While this was true for CASE member Meg Urry, it took an internship at the National Radio Astronomy Observatory in Charlottesville, Virginia, for her to consider it as a possible career. Urry is the Israel Munson Professor of Physics and Astronomy and Director of the Yale Center for Astronomy and Astrophysics.

“My college’s physics department didn’t offer a lot of astronomy courses and there was a dearth of female role models in research at the time,” Urry said. “I always knew I wanted to be involved in a profession that would impact the world; I initially thought medicine, but eventually gave myself permission to follow my passion for astronomy and astrophysics and realized that through research and teaching, I could bring people into science and to something they might not otherwise consider.

Since then, Urry has been an advocate not only for increasing diversity in the sciences, but also for promoting the impact of the physical sciences on Earth.



Students conduct physics experiments as part of the Global Teaching Project of Mississippi [Photo courtesy: Meg Urry]

Recalling an anecdote from about 10 years ago, Urry noted that a first-year graduate student came to her after spending the summer working for a NGO in South America; the student was talking

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Yale Astrophysicist Urry to Address CASE Meeting and Dinner

Meg Urry will present the keynote address at the 44th CASE Annual Meeting and Dinner on May 28, 2019.

Meg Urry, a CASE member since 2007, is the Israel Munson Professor of Physics and Astronomy and Director of the Yale Center for Astronomy and Astrophysics. Her scientific research focuses on active galaxies, which host accreting supermassive black holes in their centers. She is recognized as one of the world’s leading astrophysicists and as an advocate for women scientists.

Even as a child growing up in Indiana and Massachusetts, Urry recalls always being interested in science. Her passion led her to earn a bachelor of science degree in Physics and Mathematics summa cum laude from Tufts University in 1977, followed by a doctoral degree in Physics and Astronomy from The Johns Hopkins University in 1984.

Following a postdoctoral fellowship at the Massachusetts Institute of Technology, she joined the Space Telescope Science Institute, where she became a tenured member of the senior scientific staff and headed the Science Program Selection Office, which oversees the solicitation and review of observation proposals for NASA’s Hubble Space Telescope.

When she joined Yale in 2001, Urry was the first woman to be given tenure by the school’s Physics Department. From 2007-13, she served as Chair of the Physics Department at Yale University.

In addition to being a member of CASE, Urry is a fellow of the American Academy of Arts and Sciences, the National Academy of Sciences, the American Association for the Advancement of Science, the American Physical Society and American Women in Science. She has published more than 300 scientific articles on supermassive black holes and galaxies and has been awarded an honorary doctorate from Tufts University as well as the American Astronomical Society’s Annie Jump Cannon and George van Biesbroeck prizes. She received the 2010 Women in Space Award from the Adler Planetarium for her efforts to increase the number of women in the physical sciences. She writes about science for CNN.com.—**Karen Cohen, The WriteStuff, LLC**



CASE member Meg Urry

about dropping out of physics to return to her humanitarian work. "I was appalled we gave the student the impression that physics couldn't help anyone," she said. "While humanitarian work is obviously important and fulfilling, I impressed on her that many people have the skills and compassion to do that work; whereas she had a knowledge of science that other people don't have the capacity to understand and she could use that knowledge to change the world. For example, maybe her science would lead to the development of an efficient stove that could be mass produced at a reasonable cost and would change the lives of the people in developing parts of the world. If we all use the skills we have (and that others might not), we will achieve great things not just in the universe, but right here on Earth."

Noting that it is easy to focus on the "cool images" commonly associated with astronomy and astrophysics, Urry is intent on taking it one step further as students around the world become more socially conscious. "We need to connect science with meaningful opportunities to change things on Earth," she said. "The gulf between classes and application of scientific knowledge is huge."

She noted that advances in medicine (such as blood pressure monitoring and diagnostic tests) would not be possible without the physical sciences. "These things were developed by engineers because of work done by physicists," she said. "We need to cover all parts of the equation to solve the world's problems."

For example, space science plays a role in sustainable agriculture. "In the past, farmers would guess when it was going to rain," she

said. "With science and satellites, not only has weather forecasting gotten more reliable, but data can show how much rain each acre of farmland has received; from that, farmers can know how and when to hydrate their land to maximize yield and minimize water and nutrient waste."

Urry went on to cite scientific applications in cyber threats, poverty and border security. "There is science in remote cameras as well as artificial intelligence in signal and image processing," she said. "Following Hurricane Maria, satellite images were mined to determine where relief supplies were needed most. Astronomy provides one of the best ways to learn image processing and data mining. Think of the students we could attract if they knew they could do fun, esoteric things a lot of the time, but jump in to help when there is a hurricane. That would be attractive to a lot of people. We need more people who can address issues from a scientific standpoint."

"Many of the challenges that face our country and the world have a basis in STEM (science, technology, engineering and mathematics)," Urry said. "Even today, students lack a broad understanding of STEM and its influence. Many members of Congress and the US judiciary are making policy decisions without fully understanding the scientific and technological issues."

In an article in *Scientific American* prior to the 2018 midterm elections, ("A Conversation with One of the Few Scientists in Congress," July 31, 2018), Rep. Bill Foster (D-Illinois) commented that he was the third physicist in Congress when he came to Capitol Hill. "We still have a PhD in mathematics, Rep. Jerry McNerney of California," Foster said. "But in terms of physics, chemistry, et cetera, I'm all that's left." Foster worked for more than 20 years as a physicist at Fermi National Accelerator Laboratory in Batavia, Illinois.

He continued: "Almost every issue that comes up has a technological edge to it. For example, with the Iran nuclear deal, I found that members of Congress—both Democrats and Republicans—would just come to me, asking me to serve as an interpreter on the purely technical aspects of it. There's only one of me, and there are 434 other members of the House; so I simply couldn't provide the diffusion of technical knowledge that is missing here. I spent a long time in classified briefings with the experts at the weapons labs and asked all the 'What if' questions and 'Would we be able to detect something under the agreement?' Then I had to translate all that technical information."

The magazine *Nature* notes that at least 11 candidates with backgrounds in science, technology, engineering or medicine were elected to the US House of Representatives in 2018. ("Science candidates prevail in US midterm elections," Nov. 6, 2018). In the same article, Foster comments that he is feeling good. "We'll have a much deeper bench among STEM candidates in future races for Congress," he says.

Urry noted that one of the best ways to bring talent into the sciences is by enhancing the education system. "There are innovative things going on in terms of education and bringing access to all students," she said.

The Global Teaching Project is one example. Urry serves on the Advisory Board of the organization, which provides resources to help students with challenging classes and to help teachers teach advanced material. They film lessons by highly qualified teachers and provide support through on-site classroom teachers, local tutors and online tutoring. Students attend a two-week bootcamp in the summer to prepare for the classes (<https://globalteachingproject.com/>).

"The number of kids who have the ability to thrive at top-notch universities is driven by the quality of their high school preparation,"

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The Connecticut Academy of Science and Engineering

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IN BRIEF

Science and Engineering Notes from Around Connecticut



Biomedical Research

JACKSON LABS SURPASSES JOBS GOAL. Last summer, it was announced that the **Jackson Laboratory for Genomic Medicine (JAX)** in **Farmington** surpassed its 10-year goal of employing a minimum of 300 people, with at least 30% providing salaries at or above 125% of the state average. More recently, JAX reported 385 people employed at the laboratory, including 29 research faculty, and salary requirements have been far exceeded. Connecticut approved a \$291 million incentive package in 2012, including a \$99M grant and \$125M in loans. By meeting the agreed goals, JAX will see 86% of the state loans forgiven.

STEITZ HONORED WITH LASKER-KOSHLAND AWARD. **CASE** member **Joan A. Steitz** was named the recipient of the 2018 Lasker-Koshland Special Achievement Award in Medical Science, one of the highest forms of recognition a scientist can receive. Steitz is Sterling Professor of Molecular Biophysics and Biochemistry at **Yale School of Medicine** and a **Howard Hughes Medical Institute** investigator. The Lasker Foundation cites her pioneering role in expanding our understanding of RNA biology and her lifelong advocacy for inclusion of women in the sciences.

JACKSON LAB LANDS GRANT FOR ANTIMICROBIAL RESEARCH. The **Jackson Laboratory for Genomic Medicine (JAX)** and biotech firm **Azitra Inc.** announced a \$500,000 grant from the **US Department of Defense** to study how antimicrobial medicines, which prevent the growth of microorganisms, can be used to combat skin infections. **Julia Oh**, an assistant professor at JAX and a skin microbiome expert said, "This research will extend our understanding of how the bacteria making up the microbiome compete and has the potential to generate new tools to combat challenges such as staph infections."

CA MEDICAL DEVICE FIRM TO OPEN NORWALK OFFICE. **BioSig Technologies, Inc.**, a medical device company based in Los Angeles, announced it would open a new office in **Norwalk**. The company's first east coast location, this office will support activities in commercialization, sales support, investor relations and business development. BioSig Technologies has developed a biomedical signal processing platform for the electrophysiology marketplace.

STARTUPS CHOSEN FOR BIOSCIENCE PROGRAM. The **Accelerator for Biosciences in Connecticut (ABCT)**, a program of **designtechologies llc**, selected a second cohort of 12 emerging biosciences ventures for 2019. ABCT will provide the startups with education and networking opportunities with the program's supporting companies, including **Purdue Pharma**, **Pfizer** and **Microsoft**. The startups include researchers from **University of Bridgeport**, **UConn**, and **Yale**, as well as from **Vanessa Research**, **Einstein**, and **Weill Cornell**, and independent researchers. Some inaugural cohort members have already secured their first customer sales and landed seed funding, including **Shoreline Biome**, **LifeStyle CX**, and **SolAware**.



Business & Industry

UConn, INNOVATE STAMFORD TO JOIN FORCES. A new partnership was recently announced between the **UConn** and **Innovate**

Stamford to provide new programs, with the goal of strengthening **Stamford** as a leader in technology, innovation, and entrepreneurship. The first program will be a summer internship for 50 **UConn** students who will be placed with area businesses for two months' training in entrepreneurship and innovation. "UConn is playing a transformative role for the 21st century as the state's public research university, anchoring it as a vital center of competence to help tackle social challenges and drive economic growth," says **CASE** member **Radenka Maric**, vice president for research at **UConn**. **Innovate Stamford** was initiated in 2017 with a \$2 million grant from **CTNext**, a wholly-owned subsidiary of **Connecticut Innovations**.

FINANCIAL TECH HUB TO OPEN HQ IN WEST HARTFORD. **Ideanomics** (formerly known as **Seven Stars Cloud Group Inc.**) took ownership of **UConn's** former **West Hartford Campus** and is beginning the process of transforming the 58-acre campus into "Fintech Village." The village is described by company executives as "an ultra high-speed computing facility and laboratory for developing new and leading edge fintech solutions utilizing artificial intelligence, deep learning, IoT, and blockchain." The \$238M project is expected to create 330 jobs over the next five years. The company, which specializes in working with financial and manufacturing industries to secure technology for financial transactions, will receive a \$10M loan through the state's First Five Plus program for capital renovation, which can be forgiven if the job creation targets are met.

JETBLUE OPTS FOR P&W'S GEARED TURBOFAN ENGINE. **JetBlue Airways** announced it will use **Pratt & Whitney's** Geared Turbofan™ (GTF) engines on its new fleet of 60 **Airbus A220-300** aircraft. "The role Pratt & Whitney has played in the development of this aircraft—and, in fact, all the great aircraft we've considered—is a testament to the company's vision and its talented team," said **Robin Hayes**, chief executive officer of **JetBlue**. **Pratt & Whitney** engines have been powering **JetBlue's** fleet since 2000.

USAF CHOOSES KAMAN FOR BOMB FUZE ORDER. **Kaman Corporation** announced last fall that it had received a \$48.6M bomb fuze order from the **US Air Force (USAF)**. The joint programmable fuzes (JPF) will be produced in **Middletown, CT**, and **Orlando, FL**. The JPF are used to arm **US** and allied warplane bombloads and are deployed with several weapons such as general purpose bombs and guided bombs on a variety of domestic and international aircraft. This sale solidifies **Kaman's** position as the sole provider of joint fuzes to the **USAF** since 2002.

P2 SCIENCE OPENS FIRST-OF-ITS-KIND PLANT IN NAUGATUCK. **P2 Science Inc.**, a venture-backed, bio-renewable chemistry company, cut the ribbon for their green chemistry advanced manufacturing plant in **Naugatuck**, with production beginning last fall. The plant is the first of its kind in the world to focus on renewable intermediates and ingredients for fragrances, flavors and cosmetics. The plant is designed to be expanded easily at the current site, with room for additional production units. Included among the various state representatives and business leaders who spoke at the event was **CASE** member and **P2 Science** co-founder **Paul Anastas**, director of **Yale University's Center for Green Chemistry and Green Engineering**.

UTC TO SPLIT AFTER ROCKWELL ACQUISITION. **United Technologies (UTC)** last fall announced the completion of its \$23 billion acquisition of aviation electronics manufacturer **Rockwell Collins** as well as its intention to separate its commercial businesses into three independent entities. The three companies will

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be **Otis**, a leading manufacturer of elevators, escalators and moving walkways; **Carrier** (formerly Climate, Controls and Security, or CCS), a global provider of HVAC, refrigeration, building automation, fire safety and security products; and **United Technologies** (comprising **Pratt & Whitney** and **Collins Aerospace Systems** — a new company formed through the combination of **UTC Aerospace Systems** and **Rockwell Collins**), a preeminent systems supplier to the aerospace and defense industry.



Communication

CT GETS 'TEXT-TO-911' SYSTEM. Connecticut has a new emergency telecommunications system using text messaging to alert police in case of an urgent incident. The new service, "Text-to-911," allows messages to be sent from a cell phone in emergency situations when it's unsafe or not possible to place a phone call. The system is intended specifically for those who are deaf, hard of hearing or have a speech disability, but it can be used during dangerous situations when it would be impractical to make a phone call, such as during a home invasion, incidents of domestic violence or an active mass shooting. Residents simply text a brief message to "911" including the location of the emergency and what services (police, fire, EMT, etc.) are needed. The call center is maintained by the **Connecticut Department of Emergency Services and Public Protection's Division of Statewide Emergency Telecommunications.**

HIGH-SPEED ISP COMPLETES INITIAL FIBER OPTIC NETWORK.

High-speed fiber optic Internet provider **GoNetspeed** based in New York recently announced completion of its initial network in **West Hartford, New Haven** and **Bridgeport**, providing residential customers and small businesses access to Internet speeds up to 1 gigabit per second, considered the fastest in the area. The company has constructed an initial footprint of more than 50 miles of high-speed fiber optic network in the state, with the ability to serve over 12,000 homes and with plans to expand to other communities.



Education & Cognition

KATSOULEAS NAMED UCONN PRESIDENT. Physicist and inventor **Thomas C. Katsouleas** has been named **UConn's** next president. He will take office on August 1, when **Susan Herbst** steps down after eight years as president of the state's flagship university. Katsouleas, who currently serves as provost and executive vice president at the University of Virginia, called UConn a vital piece of Connecticut's economic engine and pledged to ensure the priorities of the university are aligned with priorities of the state. One of his immediate goals is to double UConn's research dollars over the next decade.

CT SCHOOL NAMED NATIONAL MAGNET SCHOOL OF EXCELLENCE. The **Science & Technology Magnet High School of Southeastern Connecticut (STMHS)** in **New London** has been named a National Magnet School of Excellence by Magnet Schools of America (MSA), the national association for magnet and theme-based schools. Last fall, STMHS became a Certified National Magnet School after successfully completing a rigorous two-year evaluation process and demonstrating the best practices outlined in the Magnet School Standards of Excellence. The school draws students from New London and 29 regional towns.

DANBURY HIGH FRESHMAN AMONG 'TOP 300 MASTERS.'

Danbury High School freshman **Khushi Parikh** has been named one of the Top 300 MASTERS in the 2018 Broadcom MASTERS, a program of Society for Science & the Public. In the eighth grade as

a student at **Westside Middle School Academy**, she designed a software application to detect Lyme disease from a photo image with 90% accuracy. Her project earned nine awards at the **Connecticut Science & Engineering Fair**, including first place for the **Lockheed Martin Physical Sciences Award** and the **Urban School Challenge Middle School Division.**

DISCOVERY MUSEUM RECEIVES SIKORSKY STEM GRANT. The **Discovery Museum** in Bridgeport has received a \$20,000 grant from **Sikorsky/Lockheed Martin** to fund a STEM Accelerators program serving students in grades 5–10 interested in topics including: coding, 3-D printing and design, astronomy, biology, physics, and chemistry. The students will meet weekly at the museum for 90-minute programs. Sikorsky Vice President of Communications **Tyrone Woodyard** noted that the company shares the museum's passion for expanding young minds and helping prepare students for Connecticut's high-tech workforce.

STUDENTS WIN CTC ENGINEERING CHALLENGE. Teammates **Nate Barone, Trevor Neal, and Frank Catania** took top honors in the engineering category of the **Connecticut Technology Council's** third annual 2018 **College Tech Challenge and Hiring Fair.** Sixteen public and private Connecticut-based colleges participated in the competition, which included challenges at each campus and 79 students moving on to compete in the November finals at **Sacred Heart University.** The team developed a product to address drowsy driving.

CT AUTO BODY GROUP DONATES TO TECHNICAL HIGH SCHOOL PROGRAM. The **Auto Body Association of Connecticut** recently donated \$10,000 to the automotive collision repair and refinishing program for the **Connecticut Technical Education and Career System.** The program is offered at the following technical high schools in Connecticut: **Platt Technical High School** in Milford; **A.I. Prince Technical High School** in Hartford; **H.H. Ellis Technical High School** in Danielson; **Ella T. Grasso Southeastern Technical High School** in Groton; **H.C. Wilcox Technical High School** in Meriden; **Oliver Wolcott Technical High School** in Torrington; **Vinal Technical High School** in Middletown; and **W.F. Kaynor Technical High School** in Waterbury.



Energy

FUELCELL ENERGY TO BOOST PRODUCTION. **FuelCell Energy, Inc.**, plans to add over 100 new advanced manufacturing jobs at its Torrington manufacturing facility to support a 120% production rate increase, expanding annual production to 55 MW from the current 25 MW run-rate. This growth is due in part to two fuel cell projects awarded by the **Connecticut Department of Energy & Environmental Protection (DEEP)**, along with other awards and a backlog of projects. Among new projects for the company is one at **Trinity College** in Hartford; the school plans to augment campus energy sources with a 1.4 MW fuel cell to generate electricity and steam heat. The plant will deliver power to Trinity under a multi-year agreement with the energy company, **AEP OnSite Partners.** The project is intended to minimize environmental impact and reduce energy costs. FuelCell Energy has also signed long-term power purchase agreements for a 14.8 MW fuel cell project in **Derby** and a 7.4 MW fuel cell project in **Hartford**, both projects awarded by DEEP in 2018.

NEW NONPROFIT TO RUN SOME CT GREEN BANK PROGRAMS. **Connecticut Green Bank** created a new nonprofit to manage several energy-efficiency programs in the face of recent funding limita-

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tions. The newly registered 501(c)(3), called **Inclusive Prosperity Capital**, began operating Green Bank programs that finance solar panel arrays and other energy offerings for low- and middle-income homeowners, multifamily properties, small businesses, schools and nonprofits. The CT Green Bank retained commercial and industrial clean-energy financing programs including **C-PACE** and **Small Business Energy Advantage** and will continue to operate the state's solar energy incentive program, providing funds to solar buyers that are paid back with clean energy credits.

DRONES TO INSPECT HIGH-VOLTAGE INFRASTRUCTURE.

Eversource Energy will use drones to inspect electric lines. The autonomous aerial devices can inspect high-voltage infrastructure, including in remote areas. Drones decrease the need for periodic inspections by low-flying helicopters, reduce the use of fossil fuels, lower the costs associated with annual inspections, as well as "reduce the need for vehicle access to inspect equipment in environmentally sensitive areas," according to the company.

EVERSOURCE COMMITS \$7M TO UCONN CENTER. **Eversource Energy** announced its commitment to an additional \$7M in investment over the next three years for **UConn's Eversource Energy Resource Center**. The funds will be used by researchers to create a state-of-the-art power grid simulator, allowing UConn researchers to develop strategies to make the actual power grid more effective.

OXFORD POWER PLANT OFFICIALLY COMMISSIONED. The **CPV Towantic Energy Center** in Oxford, which went online last June, was formally commissioned by state and local officials this fall, making the natural gas-fired plant one of the state's largest single generator plants—second only to **Dominion Energy's Millstone** nuclear power plant in Waterford. Development of the plant took more than 20 years, due to a both litigation stemming from community opposition, and market cycles that slowed the project.



Environment

'WHAT'S IN? WHAT'S OUT' CAMPAIGN LAUNCHED. New residential recycling guidelines were issued last summer after the transition to single stream recycling, with larger household bins, resulted in consumers tossing in items that are not recyclable. The **Connecticut Department of Energy and Environmental Protection (DEEP)** launched a public awareness campaign called "What's In? What's Out?" to help residents understand which items can and cannot go in their blue bins. Connecticut's recycling facilities are seeing higher levels of contamination than ever before, with 14–19% of the materials received containing contaminants.

RECYCLED PAINT NOW AVAILABLE. **Connecticut** residents can now purchase recycled paint created from paint collected in Connecticut. The paint, created by MXI Environmental Services, is currently only available at the **Habitat for Humanity ReStore** in Danbury. The recycled paint stems from a 2011 law passed that established a paint stewardship program. Under that program, which took effect in 2013, \$0.72 was added to every gallon of paint sold; the fee permits unwanted and leftover paint to be recycled for free at 146 collection points across the state, usually paint and hardware stores. MXI, based in Virginia, collects the paint and separates it by color and base. It is then re-blended to make the new paint.

GRANT SUPPORTS BEACH MONITORING. The US Environmental Protection Agency (EPA) will provide \$211,500 to the **Connecticut Department of Public Health** to support beach water quality monitoring and public notification efforts. The grant

is a portion of the \$1,086,000 EPA plans to award to New England states for beach monitoring and reporting as part of the Beaches Environmental Assessment and Coastal Health (BEACH) Act. When bacteria levels are too high for safe swimming, these agencies notify the public by posting warnings or closing the beach.

CLEAN ENERGY GROUP URGES FOCUS ON TRANSPORTATION, ENERGY EFFORTS. In December, **Acadia Center**, a regional non-profit focused on developing a clean energy economy, released a "Memo To The Next Governor of Connecticut" urging that attention be given to improving transportation infrastructure and bolstering clean energy efforts in order to improve the health of Connecticut's residents, as well as adding 33,000 new jobs and \$11 billion in economic benefits. "The recommended reforms are achievable, the benefits are concrete, and the time is now to build a stronger Connecticut," said **Daniel Sosland**, Acadia Center's president.



Food & Agriculture

HYDRILLA FOUND IN THE CONNECTICUT RIVER. Hydrilla (*Hydrilla verticillata*) is one of the most troublesome invasive aquatic plants in many southern states. It damages native ecosystems, harms fisheries, limits recreation, impedes navigation, and reduces property values. Previously rare in the state, hydrilla has now found its way into the **Connecticut River** as far north as southern Massachusetts. A task force led by **The Connecticut Agricultural Experiment Station** through its **Invasive Aquatic Plant Program (IAPP)** conducted a survey and found that portions of the river and its coves downstream from Hartford are alarmingly choked with the weed. Moreover, the hydrilla found in the Connecticut River is far more robust than that seen before in the state's lakes. Genetic testing suggests it is a different biotype than found elsewhere in North America.

CT REPORTS FIRST HUMAN ASIAN LONGHORNED TICK BITE.

On October 1, the **Tick Testing Laboratory** at **The Connecticut Agricultural Experiment Station** confirmed Connecticut's first case of a human Asian longhorned tick bite in a Fairfield resident. The species was first identified on a sheep farm in New Jersey in 2017, but has made its way into New England, as far east as Rhode Island. The tick, *Haemaphysalis longicornis*, is considered a major livestock pest but also can transmit several human pathogens, including spotted fever rickettsiosis. Native to China, Japan and Australia, the ticks reproduce asexually; a single, unfertilized female can produce many offspring without mating, allowing the ticks to spread rapidly.

RECORD LEVELS OF WEST NILE DETECTED IN 2018. Researchers at **The Connecticut Agricultural Experiment Station** detected record levels of West Nile virus activity throughout Connecticut this past summer in their statewide Mosquito/Arbovirus Surveillance Program. Nearly 400 isolations of the virus were made from 13 different species of mosquitoes trapped in 53 towns. Twenty-three human cases of West Nile virus-associated illness were reported, including one fatality, from residents in 19 towns. Two equine cases were additionally reported. Similarly high levels of activity and human cases were reported throughout the Northeast.

FARM AID GRANTS ANNOUNCED. Farm Aid recently announced \$30,000 in grants to **Connecticut** farming-related organizations. The recipients, each of which will receive \$5,000 Farm Aid grants, include: **Hartford Food System**, **Bridgeport Farmers Market Collaborative**, **CitySeed** in New Haven, **KNOX Inc.** of Hartford, **Green Village** initiative in Bridgeport, and Hartford-based **Connecticut Farmland Trust**. The trust helps preserve and protect farmland across the state from non-agricultural development.

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Health

DPH RENEWS LEAD POISONING CAMPAIGN. The **Connecticut Department of Public Health** relaunched a campaign in 2018 to educate parents on the dangers of childhood lead poisoning, including suggested steps to prevent lead exposure. The CDC-funded campaign consists of billboards, ads on Pandora and Facebook, Public Service Announcements, and work with community organizations.

STATE FUNDS NEW HAVEN RECOVERY CENTER. New Haven's **Cornell Scott-Hill Health Center** recently received \$10M in state funds to build a recovery center. The center, with 52 beds for men and women and a kitchen, replaces the **Grant Street Partnership** program. It will offer outpatient therapy, mental health and drug counseling, life skills workshops and primary care medical services in a new 44,000-square-foot facility.

UConn HEALTH OPENS BREAST MILK DEPOT. **UConn Health** has opened the first hospital-based breast milk depot in the state, partnering with **Mothers Milk Northeast**. Donor moms can drop off breast milk at the hospital, and the staff gets the milk to babies in need. "It is incredibly important for these premature babies to receive mother's own milk," said **Marisa Merlo**, UConn Health lactation consultant.

TEAM IDENTIFIES GENETIC BIOMARKER LINKED TO RARE INFANT CONDITION. A report published in the December 18, 2018, journal *Neuron* and co-authored by CASE member **Murat Gunel**, discusses recent genetic biomarkers found to be associated with a significant percentage of a rare but often deadly malformation of blood vessels in the brains of infants. The condition, Vein of Galen malformation (VOGM), causes arteries pumping high-pressure blood to bypass the normal capillary system and instead funnel directly into veins, exposing them to abnormally high pressures, causing vessel rupture and brain hemorrhage in newborns. The research team analyzed all of the genes of 55 children with VOGM and their parents and discovered parents carried a mutation of the gene (EPHB4) responsible for this increased risk.

CT HIV CASES RISE IN 2016-2017. New data released by state health officials in January indicate that people diagnosed with HIV increased in **Connecticut** from 2016 to 2017, but over the long term, new cases of the disease have been on the decline. There were 281 new HIV cases in 2017, up from 266 the year before. It was one of only four year-over-year increases in HIV diagnoses in a decade and a half of state data. In 2002, there were more than twice as many diagnoses, since then that number has sharply dropped.



High Technology

INFOSYS LAUNCHES HARTFORD TECH HUB. **Infosys**, a global leader in digital services and consulting, launched its **Technology and Innovation Hub** in the **Goodwin Square Building** in **Hartford** in December. The company's new Hartford Hub will serve as the global Hub for its InsurTech and HealthTech efforts, featuring Living Labs for the Future of Insurance, the Future of Healthcare and the Future of Manufacturing, among others. The Living Labs enable rapid experimentation and exploration of innovation efforts.

QUANTUM CIRCUITS OPENS NEW HAVEN FACILITY. **Yale** startup **Quantum Circuits Inc. (QCI)** opened its New Haven devel-

opment and testing facility for quantum computing in January. The facility includes 6,000 square feet of laboratories and in-house manufacturing, housing more than 20 scientists and engineers. QCI is developing the first practical quantum computers with the potential to enable calculations at magnitudes faster and more powerful than today's supercomputers. QCI's founding team includes **Michel Devoret**, Yale's F.W. Beinecke Professor of Applied Physics and Physics; **Luigi Frunzio**, a senior research scientist in applied physics; and chief scientist and CASE member **Robert Schoelkopf** who pioneered the field of quantum computing with superconducting circuits. Their lab was the first to perform quantum algorithms and quantum error correction in integrated circuits.

NCCC AWARDED GRANT FOR ADVANCED TECHNOLOGY PROJECT. **Northwestern Connecticut Community College (NCCC)** has been awarded a \$599,877 grant by the National Science Foundation for a project to prepare middle school, high school, and community college students to enter advanced technology careers. "The project, Engaging Students from Classrooms and Camps to College and Advanced Technological Careers, was developed to answer Connecticut's increasing need for a strong technical workforce," said **Sharon Gusk**, an NCCC professor and the project's director and developer. Industry partners include **Altek Electronics**, **Jackson Labs**, and **Wittmann Battenfeld Inc.** Industry-based externships and workshops will be offered for middle and high school teachers to help them prepare their students to pursue college degrees and careers as technicians.

HOLBERTON EAST COAST LOCATION IN NEW HAVEN. San Francisco-based **Holberton School**, which trains students to be software engineers for jobs in aerospace, medical equipment manufacturing and biotechnology, opened its only East Coast location in **New Haven** in January. The school, located at 470 James Street, is described as a "two-year college alternative full-stack software engineering program." It will initially enroll 30 to 50 students, but plans to expand to 1,000 in three or four years. Students come from diverse education backgrounds, including high school, college or individuals seeking a career change. Classes begin in January 2019. Tuition payments are not expected until after students are hired, with graduates paying 17% of their salary for three and a half years. Instruction will cover coding, software design and other fields needed by industries in Connecticut, such as aerospace, medical device manufacturing, finance and bioscience.

3D PRINTING STARTUPS OPT FOR HARTFORD. Several 3D printing startups have announced plans to stay in Hartford following their participation in the first **Stanley Black & Decker** incubator program. Two have Connecticut locations, while two more have ongoing projects with Stanley, the New Britain-based hand- and power-tool maker. Starting in July 2018, Stanley hosted 10 tech startups and their founders at its **Stanley Technology Center**, a training and research site still under development at One Constitution Plaza.

DEREK SLAP TAPPED TO HEAD CTC. **Derek Slap** has been named the new president and CEO of **The Connecticut Technology Council (CTC)**, the statewide association of technology-oriented companies and institutions. Slap, an experienced marketer, communications professional, nonprofit manager and public servant, replaces CASE Honorary Member **Bruce Carlson**, who stepped down from his position at the end of 2018 after five years. Slap's appointment comes after his election as a State Representative for the 19th Assembly District in Nov. 2018. Just weeks ago he ran and won election for the Senate 5th district seat vacated by former State Senator **Beth Bye**, who stepped down earlier this month to

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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).

◆ ‘Low Resource’ Areas Focus of Health Care Report

A follow up to the milestone 2001 report “Crossing the Quality Chasm,” this report expands the study worldwide with particular attention to “low resource” areas. The study attributed 5.7–8.4 million deaths annually to poor quality of care in low- and middle-income countries, accounting for 10–15% of the total deaths in these countries. Further, the report notes the challenges posed by environments of extreme adversity such as conflict zones and refugee camps, affecting approximately 2 billion people. Recognizing that a move toward universal health coverage is the central theme of global health policy today, the authors of the report conclude that even if such a movement succeeds, billions of people will have access to care of such low quality that it will not help them—and indeed often will harm them. While acknowledging that achieving quality improvement will differ in every country, the report recommends adherence to a set of principles, including strong leadership, commitment, cooperation and a system for feedback to continuously update policies and systems.

nam.edu/procuring-interoperability-achieving-high-quality-connected-and-person-centered-care/

◆ Improving Industrial Stormwater Permitting Process

A new report from the National Academies offers guidance to the US Environmental Protection Agency (EPA) to inform the next revision of a permit program that requires industries to manage stormwater in order to minimize discharges of pollutants to the environment. Industrial stormwater results when precipitation and/or runoff comes in contact with industrial manufacturing, processing, storage, or material overburden and then runs offsite, entering drainage systems or other waters. In 1987, Congress significantly expanded the National Pollutant Discharge Elimination System (NPDES) program by amending the Clean Water Act to include industrial stormwater runoff conveyed directly to receiving waters or indirectly through municipal separate storm sewer systems. The added regulation in the NPDES program has been challenging, in part because stormwater is produced throughout a developed landscape, and in part because its production and delivery are episodic. This study, which builds on a 2009 report, recommends ways that EPA can strengthen the Multi-Sector General Permit program to provide its intended environmental protection while balancing the overall burden of monitoring on industry.

www.nap.edu/read/25355/

◆ Study Examines Role of State Governments in Economic Development and R&D Competitiveness

Federal investments in research and development have historically supported the security of the nation, protection of public health and the environment, growth of new industries, and employment of millions of Americans. Proposed cuts to federal support and policy guidance could encourage more state governments to take on new or larger roles in developing innovation policy priorities. On October 17 and 18, 2017, the Government-University-Industry Research Roundtable met to consider how federal R&D policies affect states, and how state governments’ roles in shaping local and regional innovation ecosystems will affect national R&D competitiveness and economic growth. Speakers also discussed ways in which economic development efforts in states and regions drive innovation and economic growth. This publication briefly summarizes the presentations and discussions from the meeting.

www.nap.edu/catalog/25022

The following Connecticut scientists were elected to the National Academies in 2018:

NATIONAL ACADEMY OF ENGINEERING

W. Mark Saltzman, PhD

Goizueta Foundation Professor of Biomedical Engineering,
Chemical & Environmental Engineering & Physiology
Yale University

NATIONAL ACADEMY OF MEDICINE

David Allen Hafler, MD, MSc

William S. and Lois Stiles Ederly Professor of Neurology and
Professor of Immunobiology
Yale School of Medicine

NATIONAL ACADEMY OF SCIENCES

David Bercovici, PhD

Frederick W. Beinecke Professor of Geology and Geophysics
Yale University

Igor B. Frenkel, PhD

Professor of Mathematics
Yale University

Akiko Iwasaki, PhD

Waldemar von Zedtwitz Professor of Immunobiology and
Molecular, Cellular, and Developmental Biology;
Investigator, Howard Hughes Medical Institute;
Yale School of Medicine

Haifan Lin, PhD

Eugene Higgins Professor of Cell Biology and Director,
Yale Stem Cell Center
Yale University

David G. Schatz, PhD

Waldemar Von Zedtwitz Professor of Immunobiology
Yale School of Medicine

Günter Paul Wagner, PhD

Alison Richard Professor of Ecology and Evolutionary Biology
Yale University

◆ Action Collaborative to Address Clinician Well-Being and Resilience

The National Academies have responded to increasing evidence on burnout among physicians and other health providers with a variety of vehicles including a Clinician Well-Being Knowledge Hub, which is billed as a “comprehensive repository on clinician burnout and well-being” for clinicians and health system leaders. The resource center includes peer-reviewed research, news articles, blog posts, toolkits, reports and briefs. In addition, in August 2018, the National Academy of Medicine initiated a consensus study that will examine the scientific evidence regarding the causes of clinician burnout, its consequences and potential interventions.

nam.edu/initiatives/clinician-resilience-and-well-being/

◆ Returning Individual Research Results to Participants

This report—a National Academy of Medicine “Special Publication”—explores solutions to achieve large-scale interoperability of digital technology such as electronic medical records. Three “envi-

(See NAS, page 8)

become commissioner of the **Office of Early Childhood**. A Special Election is scheduled April 16 for his vacated Assembly District seat.

INTERNATIONAL SPACE TRADE SUMMIT PLANNED FOR HARTFORD. The first **International Space Trade Summit** will take place in **Hartford** this May. The US Department of Commerce, which initiated the trade conference to boost Connecticut business, says the purpose of the summit is to bring aerospace suppliers into the space sector. NASA plans to begin the groundwork to send Americans back to the moon for long-term exploration, with plans to send astronauts to Mars in the future. Space exploration is prompting government and industry to organize partnerships and work with engineering schools to find new workers.



Transportation

LAMONT PROPOSES HIGHWAY TOLLS. Governor **Ned Lamont's** budget includes highway tolls to raise revenue to address the state's aging highway infrastructure. Lamont proposed to legislators two options: one for tolling only large trucks and one for tolling every vehicle. His budget currently calls for 53 tolls on I-84, I-95, I-91 and Route 15 to raise \$800 million per year. The Governor's proposal, as well as other proposed bills related to the topic, are being considered this legislative session.

BRADLEY AIRPORT ROADWAY WORK NEARS COMPLETION. Roadway construction at Bradley International Airport's Route 20 entrance is approaching completion, with new traffic patterns established over the last few months to allow for the completion of the construction. The Connecticut Airport Authority began the construction of the new roadway configuration—part of a \$1.4 billion, 20-year master plan for the airport—in June 2017. The changes will provide a new entrance to the airport at the Route 20 access point. The new roadway system will also result in the opening of a 19-acre site, which will be used for the future development of the airport's Ground Transportation Center.

UCONN LAB GETS SELF-DRIVING SIMULATOR. A rebuilt, self-driving 2014 Ford Fusion was delivered to **UConn's Human Factors Lab** at **UConn's Connecticut Transportation Safety Research Center** to serve as a full-scale simulator for the study of future driving technologies such as autonomous and internet-connected vehicles. The university and the **Connecticut Department of Transportation** shared the \$400,000 cost. The simulator was built by Michigan-based Realtime Technologies, a division of FAAC Incorporated, which manufactures driving simulators for buses, police cruisers and military combat convoys.

BRANFORD SITE OF WORLD'S FIRST ELECTRIC/SOLAR PUMP-OUT BOAT. State and federal government agencies have launched the world's first electric/solar pump-out boat in **Branford**. The 20-foot center console has solar panels that power Torqeedo electric engines. The boat cost about \$200,000, and starting in the spring 2019, will be used to pump sewage from boats in the **Branford River** and **Branford Harbor**. Because the **Long Island Sound** is a no-discharge zone, an estimated one million gallons of sewage is pumped from boats every year. The pump-out boat will be stationed at **Safe Harbor Marinas/Bruce and Johnson's Marina** in Branford.

AIRPORT GETS SAFETY UPGRADE. **Waterbury-Oxford Airport** completed a month-long reconstruction and safety improvement project in the fall of 2018. The \$32 million project included the total reconstruction of the existing pavement on the 5,800-foot runway, lowering an Eversource transmission tower, as well as new taxiway edge lights, guidance and directional signs, electrical conductors, FAA navigational aids, and airfield pavement markings. The FAA funded 90% of the cost.

— *Compiled and edited by Wendy Swift*

Urry said. "It would help to bring high-quality high school STEM education to students across the United States and the world, which, in turn, would increase the pool of talent that can go on to competitive universities and careers in science."

"If we are to have a rising standard of living in this country, it will be because our nation rises together," Urry said. "The way to prosperity is progress and in the last 100 years, much of that has come from STEM. Approximately 50-75% of our economic activity is the result of scientific discoveries that happened 50 to 100 years ago, many of which people probably thought were useless at the time. Other developing countries are pouring enormous amounts of resources into science; we stand to lose our preeminence in the world if we don't do the same. It is purely in our own self interest to invest in educating our young people, providing research opportunities and supporting our universities. We don't know which of today's research breakthroughs are going to be the game changers of the future. Gene editing was an accident; the big discoveries happen serendipitously. Smart people working hard have created knowledge that has led to greatness; that is the potential impact science continues to offer." —*Karen Cohen, The WriteStuff, LLC*

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ronments" are identified as critical: facility-to-facility, intra-facility and at point-of-care or macro-, meso- and micro-tier. The report identifies, key aspects of information exchange in healthcare, requirements for functional interoperability and incorporation of these requirements into contract requirements and provides a number of checklists for users and healthcare organizations.

nam.edu/procuring-interoperability-achieving-high-quality-connected-and-person-centered-care/

◆ Report Finds NETs Key to Mitigating Climate Change

Negative emissions technologies (NETs) that remove and sequester carbon dioxide from the air will need to play a significant role in mitigating climate change, according to a new report from the National Academies of Sciences, Engineering and Medicine. Some of these technologies can be deployed now, but additional ones are needed to meet climate goals. The report calls for the launch of a substantial research initiative to advance these technologies as soon as possible. Although climate mitigation remains the motivation for global investments in NETs, advances in NETs also could have economic rewards, since intellectual property rights and economic benefits will likely accrue to the nations that develop the best technology. The report's authors note that states, local governments, corporations, and countries around the world now make substantial investments to reduce their net carbon emissions and plan to increase these expenditures, including in NETs. This means that advances in NETs will benefit the US economy if the intellectual property is held by US companies.

www.nap.edu/catalog/25259

◆ Adapting to the 21st Century Innovation Environment

The innovation environment of the 21st century is characterized by disruption, accelerated technology development, and globalized access to information, which is a dramatic shift from the largely government-controlled Cold War innovation environment of the 20th century. The shift from an industrial age to an information age has lowered the barriers to entry into the global economy and compelled institutions to respond with greater efficiency and speed. How are companies, universities, and the US government adapting to an accelerated pace of innovation in the open information age? How are partnerships among the three sectors being utilized to adapt to current innovation conditions, and how can partnerships be fostered to increase US competitiveness in the global economy? To address these questions, the National Academies held a workshop in October 2018. This "special publication" summarizes the workshop.

<https://www.nap.edu/catalog/25384>