

Bulletin *of the*

CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING



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Rising to the Urban School Challenge: Helping Young Scientists Begin to Win

Struvite Precipitation and Crystal Growth. Starch-Based Polymers. Wind Harvesting with Double Helix Wind Turbines.

What do all of these scientific concepts have in common?

Each is the subject of an award-winning science project entered in the Connecticut Science and Engineering Fair (CSEF) by a student participating in the Urban School Challenge, a program initiated in 2012, and designed to assist middle and high school students from under-resourced schools in their pursuit of scientific inquiry. In keeping with its mandate to “promote interest in science and engineering on the part of the public, especially young people,” The Connecticut Academy of Science and Engineering (CASE) supports and participates in numerous activities to encourage young people to become engaged in science study and research. CASE has supported the Urban School Challenge since 2013 with funds from its Endowment Fund and Student Awards Fund. In addition to CASE’s contribution, other sponsors of the Urban School Challenge include The Travelers and Bristol-Myers Squibb.

The Urban School Challenge Program grew out of observations by CSEF board

members and judging chairs that many CSEF entries from urban districts were being submitted, but not advancing to finalist status, and that some urban school districts were not represented in the competition at all. In an effort to increase urban student participation and success at the fair, CSEF created the Urban School Challenge for students from Ansonia, Bridgeport, Danbury, East Hartford, Hartford, Meriden, New Britain, New Haven, New London, Norwalk, Norwich, Putnam, Stamford, Waterbury, and Windham—districts identified by the Connecticut State Department of Education as Priority School Districts. The Urban School Challenge provides the opportunity for students from these districts to bring their posters, prototypes, lab books, and journals to Quinnipiac University, where the CSEF is held, and to meet individually with two or three judges to discuss their work in advance of final judging rounds. Through this interaction, students have the opportunity to explain their scientific process, as well as learn and practice presentation skills. Judges provide students with guidance and insight useful for improving their projects for subsequent CSEF submissions.

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Cato T. Laurencin accepts the state’s highest technology award, the Connecticut Medal of Technology, on May 24. [Photo: Andrew Bramante, CASE Photographer]

UConn’s Laurencin Awarded Connecticut Medal of Technology

Cato T. Laurencin was honored with the 2016 Connecticut Medal of Technology at the 41st Annual Meeting & Dinner of the Connecticut Academy of Science and Engineering (CASE) on May 24, 2016, at the University of New Haven. The medal was presented by Commissioner Jonathan A. Harris of the Connecticut Department of Consumer Protection, CASE member and 2010 medal recipient Jonathan Rothberg, and CASE President Sandra Weller. Laurencin, a world-renowned physician-scientist in orthopaedic surgery, engineering, and materials science, was honored for developing technologies that are revolutionary and in use in important applications in the marketplace.

Laurencin is a University Professor at UConn—only the eighth in the school’s history—which recognizes extraordinary academic excellence and sustained, high-level achievements in administration at the school and is UConn’s highest faculty achievement. He is Chief Executive Officer of the Connecticut Institute for Clinical and Translational Science and is the Founding Director of the Institute for Regenerative Engineering and the Raymond and Beverly Sackler Center for Biomedical, Biological, Physical, and Engineering Sciences at UConn Health. Additionally, he is a professor across the uni-

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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).

◆ Concussions: ‘An Urgent Need’ for More Precise Information

The rising incidence of brain trauma from sports, military blasts, vehicle collisions, and falls prompted the faculties of Case Western Reserve University and its associated medical care programs in Ohio to convene a symposium, with the National Academy of Engineering and National Academy of Medicine, on all facets of concussion. The symposium, featuring experts and representatives in engineering, clinical medicine, military medicine, athletics, animal research, physics, and government, engaged 650 participants at the Global Center for Health Innovation in Cleveland. The Spring 2016 issue of the National Academy of Engineering’s online publication *The Bridge* presents 14 short scientific papers based on the presentations at this symposium—covering brain trauma epidemiology, mechanisms, diagnosis, treatment, and prevention. Compelling evidence from these presentations shows the urgent need for engineers, neuroscientists, and medical professionals to develop more precise information about how blunt trauma leads to

(See *NAS*, page 7)

The Urban School Challenge also provides support and resources to students in their schools, to help prepare them for the CSEF. As of 2015, schools in Priority Districts are eligible to apply for up to \$500 in mini-grant funding to meet students' essential needs, so they can complete projects and compete in the fair. In many instances, students from these districts do not have resources for basic materials like poster board or transportation to and from the fair. Some schools use the funding to purchase additional scientific equipment, such as electrometers, that can help science students for many years to come.

The Urban School Challenge Program includes an outreach program component, with CSEF board members and STEM coaches visiting schools and providing support to students for their concept development, often directing students toward literature focused on their research topics. Workshops are held across the state where parents and students can learn about expectations for participation, and students can receive help constructing outlines for their research process. In 2016, two students who had previously failed to advance past the first round of judging were advanced because of one-on-one coaching that improved their preparation for project submission.

The Awards

As part of the Urban School Challenge Program, CSEF awards the first-place high school student winner with \$500, with \$300 and

\$250 awarded to the second- and third-place winners, respectively. The high school winner also receives an all-expense paid trip to the Intel International Science and Engineering Fair, where students from over 75 countries, regions, and territories showcase their work and compete for up to \$4 million in prizes at the world's largest international pre-college science competition. Additionally, the middle school winner receives a \$300 cash award and attends a one-week summer program at Project Oceanology in Groton.

In addition to Urban School Challenge program funding, CASE also recognizes the winners of the high school and middle school divisions of the Urban School Challenge with monetary awards. These awards are in addition to program funding it provides directly to CSEF. The Academy awards the middle school winner of the Urban School Challenge a \$250 honorarium and the school's science department is recognized with a Letter of Commendation and a \$500 donation for science equipment and supplies. The Academy provides the Urban School Challenge High School Winner with a \$1,000 honorarium and a \$500 donation for the schools science department for equipment and supplies. Additionally, in partnership with the Connecticut Center for Advanced Technology, CASE awards the Urban School Challenge High School Winner with the one of three H. Joseph Gerber Medals of Excellence presented each year; the remaining Gerber Medals are awarded to the 1st Place Winners of the Life Science and Physical Science Divisions of the Fair.

Celebrating 68 Years of Competition: The 2016 Connecticut Science and Engineering Fair

The 2016 Connecticut Science & Engineering Fair took place March 15th to the 19th and marked the 68th anniversary of this annual competition. This year, 590 science and engineering projects were judged and reviewed at the week-long fair. The Urban School Challenge judging criteria includes: research question, design and methodology, execution (data collection and analysis), creativity, poster, and interview.

This year's high school first place winner is Maya Geradi, a tenth grade student at Wilbur Cross High School in New Haven. Maya's winning project is titled: Exploring Conditions for Struvite Precipitation and Crystal Growth. Maya first learned of the Urban School Challenge when she participated in the CSEF during 7th grade and won the Urban School Challenge first prize award for middle school. She has continued to participate every year since, winning first prize again in the 8th grade and now as a high school sophomore. The purpose of Maya's research "was to find a cost-effective, sustainable and environmentally-friendly method for recovering and recycling ammonium and phosphate from sewage and farm effluent and concentrated animal feeding operation (CAFOs) produced wastes." Funds made available through the Urban School Challenge allowed Maya to attend Project Oceanology Camp in seventh grade, where she visited a sewage treatment plant and became interested in this subject for continued study. She furthered her understanding by reading scientific literature on environmental management and struvite.

Maya credits the Urban School Challenge with inspiring her interest in science. She notes, "It is a wonderful concept for aiding and encouraging all science fair participating students in city schools and urban districts. I feel very honored and humbled to be invited to and receive recognition at the CASE annual meeting." Maya also recognizes "CASE's generosity benefits not only me, but my whole school in providing my school's science department with \$500 for supplies. The initiative of CASE and the Urban Challenge has inspired me to give back to society and help other students

The Connecticut Academy of Science and Engineering

The purpose of the Academy is to "provide guidance to the people and the government of the State of Connecticut ... in the application of science and engineering to the economic and social welfare."

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Biomedical Research

YALE STUDY USES EVOLUTIONARY BIOLOGY TO EXAMINE CANCER ORIGINS. A Yale cancer cell development study, led by Associate Professor of Public Health **Jeffrey Townsend**, was published February 8 in the *Proceedings of the National Academy of Sciences*. The study addresses cancer's spread, using evolutionary biology to improve understanding of cancer's genetic origins. Researchers mapped genetic cancer mutations for each patient, finding major "driver mutations" resulting in advantages to new mutations. An evolutionary approach identifies which genes are being mutated early and late.

NEW PROGRAM BRINGS PRIVATE INVESTMENT TO MEDICAL RESEARCH. Launched in February, the Program in Innovative Therapeutics for Connecticut's Health (PITCH), funded by **Connecticut Innovations** and led by CASE members **Craig Crews**, executive director of **Yale's Center for Molecular Discovery**, and **Dennis Wright** of the **University of Connecticut (UConn)**, will help bring private investment to research projects. UConn and Yale will collaborate on projects, building on basic laboratory science to generate prototype drugs for development into new medicines. The first twelve projects to receive funding are ones testing new approaches to treat cancer, liver disease, bacterial and viral infections, and inflammatory conditions.

\$1.5M GIFT CREATES ENDOWED CHAIR AT JACKSON. **Weslie Janeway**, member and the current vice chair of board of **The Jackson Laboratory**, made a \$1.5 million gift to create an endowed chair—the Janeway Distinguished Chair—at the Farmington bioscience center. CASE member **Edison Liu**, Jackson Laboratory president and CEO, recently announced the appointment of **Professor Robert E. Braun** to the Janeway Distinguished Chair. Janeway's gift brings the total of endowed chairs at the Jackson Laboratory to six. In addition to providing an important source of funding for research, endowed chairs enable Jackson Laboratory to attract, retain and support scientists.

BASERGA HONORED WITH ROSE AWARD. **Susan Baserga**, CASE member and Yale professor of molecular biophysics and biochemistry, genetics and therapeutic radiology, was awarded the William C. Rose Award from the American Society for Biochemistry and Molecular Biology on April 5. Baserga is recognized for her research in ribosome biogenesis and her commitment to the education of young scientists. She chairs the Beckman Scholars Program at Yale, and directs the largest National Institutes of Health training grant for PhD students. Baserga's investigations have contributed to the understanding of congenital diseases in which ribosome production is deficient, and to elucidating the role of ribosomes on cell growth, cell division, and cancer.

GRANTS TO SUPPORT BIOMEDICAL DEVICE FIRMS. Grants from **Connecticut Innovations (CI)** will be used to support collaborative efforts between **Yale's Center for Biomedical and Interventional Technology (CBIT)**, CI, **UConn**, and **Quinnipiac** to encourage businesses building biomedical devices. A nanoparticle-based sunscreen and a new method to detect bloodstream infections are two projects, both initiated by Yale faculty, to receive \$1 million from CI. Other projects include a non-invasive method to measure pressure during brain swelling, based on research by Yale neurosurgeon

Ryan Grant and researchers at UConn and the University of North Carolina, and development of a device to reduce pain during bone marrow donation procedures.



Business & Industry

P&W ENGINE NAMED ENGINEERING LANDMARK. The American Society of Mechanical Engineers (ASME) recently designated **Pratt & Whitney's** R-1340 Wasp A engine an historic engineering landmark, recognizing its technical significance in engineering and aviation. The Wasp engine, built in 1925, was the first engine designed and built by Pratt & Whitney after the company was founded. "Having the first engine in our company's innovative history recognized by the industry's leading engineering organization in the United States is a tribute to the small group of visionaries who built it and set the standard for Pratt & Whitney's dependable engines," said CASE member **Tom Prete**, vice president of engineering for Pratt & Whitney, noting "The Wasp engine's legacy of revolutionizing aviation is present in our game-changing PurePower® Geared Turbofan™ engine and cutting-edge F135 engine."

INNOVATE HARTFORD TO OPEN IN FALL 2016. On March 15, Shana Schlossberg, an organizer of **Innovate Hartford**, announced plans for a 27,000-square-foot, high-tech "innovation hub" for developers of robotics and wearable technology. The new center will nurture collaboration with the region's colleges, professors, researchers and graduate students. Funding will rely on private investors. Schlossberg anticipates opening Innovate Hartford in fall 2016. It would be open to 15 startup companies with room for 200 to 250 freelance writers and graphic artists, lawyers, photographers, and "anyone who wants to service the startups," according to Schlossberg.

STATE RANKS #25 IN SOLAR-RELATED JOBS. According to a study released recently by The Solar Foundation, a renewable energy advocacy group, **Connecticut's** solar industry is ranked 25th nationally for people employed in solar-related jobs. California is ranked first and Massachusetts is ranked second. **Dennis Schain**, spokesman for the **Connecticut Department of Energy and Environmental Protection**, noted The Solar Foundation's report "shows the state to be a leader in developing forward-looking clean energy programs and in job growth related to the increased deployment of solar systems."

KAMAN ANNOUNCES LANDING GEAR CONTRACT. **Kaman Aerosystems** announced a contract with Zodiac Interconnect Americas to supply parts kits used to make landing gear for Boeing 737 MAX passenger jets. The kits will be manufactured at Kaman facilities in Jacksonville and Chihuahua, Mexico, then delivered to Zodiac plants in Chihuahua and Santa Rosa, California.



Communication

STATE MEDICAL GROUP OPTS FOR CARESCREEN PLATFORM. **The Connecticut State Medical Society-Independent Practice Association (CSMS-IPA)**, comprising 4,000 physicians in the state, has selected Suffield-based **CareScreen's** health data-sharing software platform under a five-year agreement with **Quality Health Ideas (QHI)** to improve patient care and reduce costs. The CareScreen platform, which uses real-time data, currently supports 10,000 doctors in ten states. "Our knowledge of the local landscape

Items that appear in the In Brief section are compiled from previously published sources including newspaper accounts and press releases. For more information about any In Brief item, please call the Academy at (860) 571-7143, or contact us at acad@ctcase.org.

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will support a timely rollout,” said **Phil Gaziano**, primary care physician and QHI founder. “The trust and confidence placed in us here in our home state is especially gratifying.”

PURA CYBERSECURITY REPORT NOTES CONCERNS. In April, the **Connecticut Public Utilities Regulatory Authority (PURA)** issued a report on cybersecurity compliance standards and oversight procedures following up on a report issued in 2014 by PURA. The report states most telephone service providers expressed concern with PURA’s proposed cybersecurity oversight program, noting PURA does not provide the assurances of federal programs. The report suggested distributed power generation rather than centralized power plants could enhance security. **Michael Coyle**, a PURA spokesman, said PURA is considering third-party audits to ensure utilities have adequate cybersecurity while also addressing the concerns raised by the telecommunications companies.

COMCAST ANNOUNCES NEW XFINITY APP. In April, **Comcast** announced plans to introduce an app that would allow customers to access Xfinity service directly on television sets or other devices, transforming Samsung smart TVs and Roku devices into quasi cable boxes. The app will replace cable boxes and the \$10-a-month equipment fee. The new TV app is similar to currently available apps on smartphones and tablets but more closely mirrors the cable box experience. Comcast hopes its new Xfinity TV Partner Program will expand beyond Samsung and Roku.



Education & Cognition

CT SCIENCE CENTER DEBUTS ‘SCIENCE FORWARD.’ On March 9, the **Connecticut Science Center** introduced Science Forward, an initiative to expand student learning opportunities with adaptable classroom and laboratory venues, creating accessible STEM learning spaces. The changes will occur over five years and match science curriculum needs as well as Connecticut’s economic and workforce requirements. STEM professionals and educators at the Science Center’s **Mandell Academy for Teachers** are collaborating with the **Connecticut State Department of Education** to train teachers in Next Generation Science Standards (NGSS). Science Forward is funded by a public-private partnership including \$10.5 million approved by the state in 2014, and \$5.5 million pledged by corporations, foundations, and individuals.

QUINNIPIAC GETS TEACHING GRANT. **Quinnipiac University** has received a \$191,068 grant to train teachers in Next Generation Science Standards (NGSS) as part of the Teacher Quality Partnership Program. The program centers on NGSS professional development for beginning teachers, mentors and administrators from 10 districts, including **Bridgeport, Capitol Region Education Council, East Haven, Hamden, Meriden, New Haven, North Haven, Norwich, Notre Dame High School** and **Wallingford**.

QUINNIPIAC NAMED BEST IN CT FOR GAME DESIGN. According to *The Princeton Review’s* recently published list of top 50 undergraduate schools offering game design programs for 2016, **Quinnipiac University** was named the best school in Connecticut to study game design. Criteria included the school’s academics, facilities, career services and technology.

DARIEN TEACHER HONORED. This spring, the International Technology and Engineering Education Association awarded **Darien High School Technology and Engineering Education Department Coordinator Jeremy Nelson** the Connecticut Technology Education

and Engineering Teacher of the Year Award. The award is granted to outstanding technology and engineering teachers who “will serve as models for their colleagues and who could form a leadership core to affect change in the field.” Nelson is responsible for technology, engineering, business and computers for grades 6 through 12.



Energy

DEEP PROPOSES NEW CLEAN ENERGY PROJECTS. **Connecticut Department of Energy and Environmental Protection (DEEP) Commissioner Rob Klee** recently announced an energy procurement plan for Connecticut that includes five potential projects to generate clean energy and reduce costs. Some projects include ground-mounted solar installations four to eight times larger than current Connecticut facilities. The plan could also enhance the 63.3 MW fuel cell park in **Beacon Falls**, making it the largest in the world. DEEP seeks power purchase agreements between utilities and generators totaling 4,250 gigawatt-hours of electricity per year. The bids also include transmission projects, like **Eversource’s** Northern Pass, bringing hydropower from Quebec to New England.

NATURAL GAS, COMBINED CYCLE PLANT TO REPLACE BRIDGEPORT HARBOR STATION. The coal-fired **Bridgeport Harbor Station** will close by 2021, to be replaced by a new, natural gas-fired, combined-cycle power plant beginning operations in 2019, with the capacity to produce 485 megawatts. According to New Jersey-based PSEG Power LLC, which owns the current facility, the new plant will represent “close to a \$500-million investment in the local and regional economy,” creating 350 construction jobs and about 20 permanent jobs. The new facility will be located at the existing Bridgeport Harbor Station site.

FREEDOM BRINGING SOLAR POWER TO LOW-INCOME HOUSEHOLDS. Faith Restoration Empowerment & Economic Development Outreach Ministries, Inc. (FREEDOM) began working with Connecticut churches, synagogues and mosques in February through a program of affordable solar power made accessible by leased rooftop systems. **PosiGen** and the **Connecticut Green Bank** are collaborating with solar providers, allowing low-income households to manage the expense of solar installation.

FINANCING COMPLETED FOR OXFORD POWER PLANT. Maryland-based Competitive Power Ventures (CPV) and **GE Energy Financial Services** completed financing on the 785 MW CPV **Towantic Energy Center in Oxford** on March 11. Two GE 7HA heavy-duty gas turbines with a steam turbine and associated generators will power the plant, creating electricity for powering approximately 800,000 homes. The plant will connect to **Connecticut Light & Power’s** 115 kV circuit between **Baldwin Junction** and **Beacon Falls**, using natural gas from the Algonquin Interstate Pipeline. Glastonbury’s **Gemma Power Systems** is providing engineering, procurement and construction services.

CT ENERGY STRENGTHS SHOWCASED AT GERMAN EVENT. In April, the **Northeast Electrochemical Energy Storage Cluster**, led by the **Connecticut Center for Advanced Technology, Inc.**, partnered with the **Connecticut Department of Economic and Community Development** to showcase the region’s hydrogen and fuel cell capabilities at Hannover Messe, a trade show for industrial technology innovations in Hanover, Germany. The show, the world’s largest industrial fair, draws 5,000 exhibitors from 70 countries.

MICROGRID SYSTEM ANNOUNCED FOR HARTFORD. On April 13, the **City of Hartford, Constellation** (a subsidiary of

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Exelon Corporation) and **Bloom Energy** announced the start of construction of an 800 kW microgrid system powered by fuel cells to provide electricity for **Parkville Elementary School, Dwight Branch Library, Parkville Senior Center** and **Charter Oak Health Center**. Excess electricity will reduce costs at: **Bulkley High School, Hartford High School, Weaver High School** and the **Sport and Medical Sciences Academy**. Constellation will provide engineering, procurement, construction and operation services while Bloom will provide fuel cells. The electricity will be purchased by Hartford at or below current rates through a 15-year agreement.



Environment

LAKE DATA INDICATES CT LAKES WARMING FASTER THAN GLOBAL AVERAGE. Recently published data regarding warming trends for Connecticut's lakes indicate summertime temperature measurements at **Candlewood Lake** have increased 1.2°C, or near 2.2°F, since monitoring by the **Candlewood Lake Authority** started in 1985. This trend is faster than reported in a recent global study funded by NASA and the National Science Foundation that found lakes worldwide warming at an average rate of 0.34°C, or 0.61°F, per decade. **Jennifer Klug, Fairfield University** biology professor studying **Lake Lillinonah** since 2003, said changing water temperatures and resulting change in oxygen levels could eventually be fatal to fish and the organisms on which they feed.

DEER TICKS CARRYING LYME UP STATEWIDE. According to the **Connecticut Agricultural Experiment Station**, the number of deer ticks carrying Lyme disease increased to 31% statewide in 2015, a six percentage-point increase from previous years. In addition, though at lower rates of occurrence: two other tick-borne diseases, babesiosis, a malaria-like disease, and anaplasmosis, treatable with the same antibiotics used to treat Lyme disease, also increased in 2015. **Goudarz Molaei**, director of the Station's tick-testing program, pointed to warmer winter weather as a contributing factor along with an increase in deer population.

FEDERAL AGENCIES TO STUDY PLUM ISLAND OPTIONS. On March 25, the Congressional Appropriations subcommittee on Homeland Security directed the Department of Homeland Security to work with the Environmental Protection Agency, the Department of the Interior, and the General Services Administration to study options for **Plum Island** with emphasis on environmental and historic resources. Plum Island housed a federal animal disease research facility restricting human presence, resulting in it becoming a de facto wildlife refuge and home to shore-nesting birds like the endangered Roseate Tern and Piping Plover.

RIVERBANK RESTORATION AT POND LILY DAM. On April 9, **Save the Sound**, a bi-state program of **Connecticut Fund for the Environment**, sponsored an event at the former **Pond Lily Dam** located along the **West River** on the **New Haven-Woodbridge** border to further restoration of the riverbank and provide food and shelter for wildlife. Over 150 volunteers turned out to plant native vegetation. After removal of the dam, completed in February, water levels fell, revealing garbage trapped in the mud and marsh areas; volunteers spent March removing the debris. The dam removal was supported by \$661,000 from federal Hurricane Sandy recovery funding, along with numerous other federal and state funds.

YALE LAUNCHES 'YALE CARBON CHARGE' PROGRAM. **Yale University** announced this spring that it will begin charging a carbon emissions fee for 20 campus buildings as part of a new pilot program—the **Yale Carbon Charge**. The program is the first internal carbon charge program on a university campus. According to CASE

member and **Yale President Peter Salovey**, the program is intended to “use our campus as a living laboratory for applied research on global challenges such as climate change.” **Kroon Hall**, home of the **Yale School of Forestry & Environmental Studies (F&E)** is the campus's most energy efficient building. **Susan Wells**, director of finance and administration at F&ES, launched the Yale Carbon Charge, encouraging best practices and collaboration across campus.



Food & Agriculture

NEW WEBSITE HELPS PROMOTE CT FARM PRODUCTS. The **Lower Connecticut River Valley Council of Governments Agricultural Council (RiverCOG Ag Council)** has launched a website to help farmers promote products. The website, www.ctrivervalleyfarmers.org, is the first in Connecticut to organize information by topic area and location, listing local farm and farm products. The Council received a \$28,000 state grant in 2015 to build the website and to support other RiverCOG Ag Council tasks designed to enhance farmers' success.

BLUMENTHAL PROPOSES NATIONAL, UNIFORM 'SELL BY' DATES. On February 18, **Senator Richard Blumenthal** announced new legislation for a national and uniform “sell by” date on food products to reduce consumer waste resulting from prematurely discarded food. Blumenthal noted that confusing labeling results in consumers throwing away billions of dollars' worth of edible food; the discarded food also contributes to clogging local landfills.

WILTON FARM FIRST TO RECEIVE GRASSFED DESIGNATION. **Millstone Farm** in **Wilton** has become the first farming business in Connecticut to receive the Animal Welfare Approved (AWA) Certified Grassfed designation. This is the only certification and logo in the United States and Canada guaranteeing food products come from animals fed a 100% grass and forage diet, raised outdoors on pasture or range for their entire lives, and managed according to the highest welfare and environmental standards on an independent family farm. The farm raises hens, pigs, and sheep.

VERTICAL OCEAN FARM BUILT OFF THIMBLE ISLANDS. **Bren Smith**, winner of a \$100,000 Fuller Challenge—an international competition financed by the Buckminster Fuller Institute to promote ideas in environmental sustainability—built a vertical ocean farm near the **Thimble Islands**. Smith's non-profit, **GreenWave**, received grants from federal agencies along with private donations, including \$150,000 from the Leon Lowenstein Foundation. This spring, Smith expects to employ 10-15 workers, with most of his kelp going to restaurants and markets in New York City.

NEW HAVEN LAUNCHES FOOD POLICY AGENCY. On April 21, **New Haven City Hall** announced plans to implement the **Office of Food System and Policy** with **Joy Johannes** as director to “ensure a vital, resilient and robust food system for all residents, with access to fresh and healthy food.” The agency will be part of the city's **Community Services Administration** and will work with the **New Haven Food Policy Council**. The department was created with matched funding from the Henry P. Kendall Foundation, which pledged \$115,000 over two years.



Health

STUDY EXAMINES SUBURBAN DRUG USE. In a recent study, **Yale Professor Robert Heimer** and his colleagues found Connecticut's suburban injection drug users are overwhelmingly

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white, undereducated and living in poorer areas within their suburban communities, with 62% male, most never married and 30% living in their own homes. Most people studied reported depression or chronic pain. Connecticut heroin deaths now average 222 per year, nearly double the rates of the prior decade.

CT HEALTH CENTERS TO SHARE \$2.5M FOR SUBSTANCE ABUSE PROGRAMS. Seven Connecticut health centers will receive \$2.5 million in federal money to improve and expand substance abuse services, especially for opioid use. The goal is to assist Connecticut with increasing the number of patients who can be screened for substance abuse disorders resulting in more treatment. The money is part of a \$94 million federal initiative for 271 health centers across the United States.

YALE STUDY EXAMINES VA HEALTH SYSTEM. According to a study by senior author and CASE member **Harlan Krumholz**, director of the **Center for Outcomes Research and Evaluation, Yale-New Haven Hospital**, and **Sudhakar V. Nuti**, first-year student at **Yale School of Medicine**, and colleagues, the Veterans Affairs health system performs slightly better than other hospitals in terms of lower mortality rates among older men with heart attack, heart failure, or pneumonia. The paper was published in the February 9 issue of *Journal of the American Medical Association*. However, readmission rates at VA hospitals are slightly higher for all three conditions, both nationally and within similar geographic areas. The researchers compared mortality and readmission rates between male Medicare fee-for-service beneficiaries age 65 years or older hospitalized in VA and non-VA hospitals.

YALE'S KO NAMED TO ZIKA PANEL. Professor **Albert Ko** of the **Yale School of Public Health** was recently named to an international panel responding to the threat of Zika. The Zika Task Force, made up of 23 experts in every class of virus-causing disease, is accelerating research, testing, and treatment and developing prevention tools for clinics worldwide. Ko, chair of the **Department of Epidemiology of Microbial Disease**, collaborated on research with the Oswaldo Cruz Foundation in Salvador, Brazil, studying leptospirosis and other infectious diseases primarily afflicting urban poor, and is working with Brazilian colleagues to determine the virus's role with microcephaly. The first case of Zika virus in Connecticut was confirmed on March 18 in an adult patient who had traveled to an affected area.

NALOXONE REBATE OFFERED. This spring, Amphastar Pharmaceuticals Inc., announced it will give **Connecticut** a \$6 rebate for every dose of naloxone, (a drug used to counteract opioid overdoses) bought by state, municipal or local town agencies over the next year. **State Attorney General George Jepsen** urged local police and fire departments, school districts and municipal agencies to "take advantage of this opportunity" to equip their personnel.



High Technology

YALE GETS \$1.7M FOR DATA PROTECTION PROJECT. The Department of Homeland Security (DHS) Science and Technology Directorate (S&T) has awarded \$1.7 million to **Yale University** to develop technology to protect the identity and location of individuals against malicious tracking and surveillance. The project, "PriFi Networking for Tracking-Resistant Mobile Computing," is part of the DHS S&T Cyber Security Division's larger Data Privacy program. The Yale University team, led by CASE member **Joan Feigenbaum**, proposes to build an anti-tracking and location-private network access mechanism to protect organization members on and off-site.

NEW HAVEN ALDERS APPROVE NEW TECH CAMPUS. The **New Haven Board of Alders** voted this spring to approve a plan to convert a former CTTransit bus depot, located at 470 James Street, into a business campus focusing on technology companies. The 6.5-acre property is currently vacant and owned by the state, making it tax exempt. The developers are committed to working with New Haven to create a tech and innovative business park.

UB PROFESSOR, STUDENT HONORED BY CTC. **University of Bridgeport** engineering professor **Jani Macari Pallis** and PhD candidate **Wafa Elmannai** were named 2016 Women of Innovation by the **Connecticut Technology Council (CTC)**. Macari Pallis developed an engineering curriculum, receiving over \$1.5 million in grants for curriculum development and outreach. Elmannai, who was selected for the second time by CTC for the Women of Innovation Award, studies computer science and is working on an intelligent framework to assist the visually impaired. Additionally, she received the Upsilon Pi Epsilon (UPE) Executive Council Award, the highest award given to engineering students in the United States.

CASE'S ECKBRETH HONORED WITH AIAA TECH AWARD. In February, CASE emeritus member **Alan Eckbreth** was awarded the American Institute of Aeronautics and Astronautics Technology Award for 2016. Eckbreth was selected because of his contributions and achievements toward enhancing the aerodynamic flow field and surface measurement techniques for research in flight and ground test applications. He will be honored at the AIAA Aviation and Aeronautics Forum and Expo in Washington, DC, in June.



Transportation

REPORT FINDS 357 STATE BRIDGES NEED REPAIR. A report from the American Road and Transportation Builders Association, issued in February and based on US Department of Transportation ratings, found 357 Connecticut bridges in need of repair and potentially subject to weight restrictions because of poor condition. Spokesman **Judd Everhart** of the **Connecticut Department of Transportation** emphasized that these bridges are inspected every two years, with some inspected more frequently, and are not in danger of collapsing. For a complete list of the top structurally deficient bridges, see <http://www.artba.org/state-bridge-profile-connecticut-2016/>

NORWICH TECH STUDENTS EARN TOP AUTO REPAIR PRIZE. **Devin Bialek** and **Johnathan O'Neill**, students at **Norwich Tech**, earned the top prize at the National Automotive Technology Competition held at the Jacob Javits Conference Center in New York City for diagnosing and repairing cars within a three-hour time limit. The event was organized with the New York International Auto Show, with thirty nationwide dealer associations sponsoring teams. Norwich Tech will receive a new Toyota vehicle in addition to other tools. The students won \$10,000 worth of tools, and full scholarships from several post-secondary automotive educational programs.

CTDOT TO EXPAND CTFastrak SERVICE. The **Connecticut Department of Transportation (CTDOT)** plans to expand **CTfastrak** services in communities east of Hartford beginning August 2016. The announcement is based on results of a CTDOT study; initial recommendations include extending transit service until 10:45 pm Monday through Saturday and to 7:40 pm on Sunday on bus routes 82, 83, 84, 88, 91 and 95. Further, the DOT began retrofitting existing CTtransit bus fleet with new technologies to provide real-time travel information by the end of 2016.

—Compiled and edited by Wendy Swift

brain tissue injury, how the effects of repeated trauma may accumulate over time, and how this accumulation results in long-term and progressive brain tissue damage and human behavior dysfunction.

<http://www.nae.edu/Publications/Bridge/151971/152223.aspx>

◆ Role of Fatigue in Crash Risk for Bus, Truck Drivers

There are approximately 4,000 fatalities in crashes involving trucks and buses in the United States each year. Though estimates are wide-ranging, possibly 10-20% of these crashes might have involved fatigued drivers. The stresses associated with their particular jobs (irregular schedules, etc.) and the lifestyle that many truck and bus drivers lead puts them at substantial risk for insufficient sleep and for developing short- and long-term health problems. A new report from the National Academies of Sciences, Engineering, and Medicine finds that insufficient sleep can decrease a commercial motor vehicle (CMV) driver's level of alertness, which may increase the risk of a crash; yet little is known about effective ways to minimize that risk. Current research on the connection among hours of service, fatigue, and accident frequency for CMV operators is complicated by the difficulty of measuring driver fatigue objectively, the invasive nature of capturing measures of the amount and quality of drivers' sleep, and many factors contributing to crashes that are unrelated to lack of sleep. This report assesses the state of knowledge about the relationship of such factors as hours of driving, hours on duty, and periods of rest to the fatigue experienced by truck and bus drivers. It also evaluates the relationship of these factors to drivers' health over the longer term and identifies improvements in data and research methods.

<http://www.nap.edu/catalog/21921/commercial-motor-vehicle-driver-fatigue-long-term-health-and-highway-safety>

◆ Raising Awareness of Ethics in Engineering

Ethical practice in engineering is critical for ensuring public trust in the field and in its practitioners, especially as engineers increasingly tackle international and socially complex problems that combine technical and ethical challenges. This new report from the Center for Engineering Ethics and Society of the National Academy of Engineering aims to raise awareness of the variety of exceptional programs and strategies for improving engineers' understanding of ethical and social issues and provides a resource for those who seek to improve ethical development of engineers at their own institutions. The report, which is intended to serve as a resource for institutions of higher education seeking to enhance their efforts in this area, presents 25 activities and programs to infuse ethics into the development of engineering students.

<http://www.nae.edu/150176.aspx>

Laurencin *(from page 1)*

Laurencin is a board certified orthopaedic surgeon, endowed Professor of Orthopaedic Surgery, and was the faculty leader in the development of the Bioscience Connecticut Initiative.

Laurencin is the scientific founder of Soft Tissue Regeneration, a Connecticut company that is commercializing breakthrough technologies for anterior cruciate ligament (ACL) regeneration and rotator cuff regeneration. The rotator cuff device has been cleared for use by the FDA, and the ACL device is in clinical trials in Europe. Dr. Laurencin also is Scientific Co-founder of Natural Polymer Devices, a Connecticut company focused on developing polysaccharide polymer technologies for bone regeneration, which is in the process of seeking FDA clearance of a novel fracture repair device for the treatment of cervical spine fractures.

Laurencin has served as a permanent member of the orthopaedic device panel for the US Food and Drug Administration and was appointed to the National Science Advisory Board of the FDA, the overseeing body of that agency.

◆ Estimating the Role of Climate Change in Extreme Weather Events Using 'Extreme Event Attribution'

It is now possible to estimate the influence of climate change on some types of extreme events, such as heat waves, drought, and heavy precipitation, says a new report from the National Academies of Sciences, Engineering, and Medicine. The relatively new science of extreme event attribution has advanced rapidly in the past decade owing to improvements in the understanding of climate and weather mechanisms and the analytical methods used to study specific events, but more research is required to increase its reliability, ensure that results are presented clearly, and better understand smaller scale and shorter duration weather extremes such as hurricanes and thunderstorms. As event attribution capabilities improve, they could help inform choices about assessing and managing risk and in guiding climate adaptation strategies. This report examines the current state of science of extreme weather attribution, and identifies ways to move the science forward to improve attribution capabilities.

<http://www.nap.edu/catalog/21852/attribution-of-extreme-weather-events-in-the-context-of-climate-change>

◆ Forging the Research Foundations for the Next-Generation Electric Grid

For the vast majority of Americans, electricity is obtained from large, interconnected power grids. However, the grid that was developed in the 20th century, and the incremental improvements made since then, including its underlying analytic foundations, are no longer adequate to meet the needs of the 21st century. The next-generation electric grid must be more flexible and resilient, accommodating a wider mix of more intermittent generating sources, such as wind and distributed solar photovoltaics. Achieving this will require continued shorter-term engineering research and development. But there is also a need for more fundamental research to expand these analytic foundations. This report from the National Academies of Sciences, Engineering, and Medicine provides guidance on the longer-term critical areas for research in mathematical and computational sciences that is needed for the next-generation grid and offers recommendations designed to help direct future research and give the nation's research and development infrastructure the tools it needs to effectively develop, test, and use this research.

<http://www.nap.edu/catalog/21919/analytic-research-foundations-for-the-next-generation-electric-grid>

He is an elected member the National Academy of Medicine and the National Academy of Engineering, the first orthopaedic surgeon in history to achieve dual election. In Connecticut, he was named the 2014 CURE Connecticut Academic Entrepreneur of the Year. He is a recipient of the National Medal of Technology & Innovation (2015) and the Technology Innovation and Development Award from the Society for Biomaterials, was named one of the 100 Engineers of the Modern Era by the American Institute of Chemical Engineers (2009), and was inducted into the National Academy of Inventors (2013).

He is a Fellow of the American Academy of Orthopaedic Surgeons, the American Institute of Chemical Engineers, the Biomedical Engineering Society, the Materials Research Society, and the American Chemical Society. He is a Fellow of the Indian National Academy of Sciences, a Foreign Fellow of the Chinese Academy of Engineering, an Associate Fellow of the African Academy of Sciences, and a Fellow of The World Academy of Sciences.

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Urban Challenge *(from page 2)*

in the urban districts, as well. I would like to express my profound thanks to both CASE and the Urban School Challenge." Most recently, Maya brought her project to Houston to participate in the 9th Annual International Sustainable World (Energy, Engineering & Environment) Project Olympiad (I-SWEEEP) held from April 27 – May 1, 2016, where 385 highly qualified projects from 62 countries were presented. Maya's project earned the distinction of a gold medal in the Environment-Management & Pollution category.

The 2016 Middle School First Place Winner is Lasyapriya Josyula, a seventh grade student from Westside Middle School Academy in Danbury. This was the first science fair Lasya entered. She learned about the Urban School Challenge while researching which category her project, Study of Various Starch-Based Polymers, would best fit. Lasya noted the winner would be awarded \$300 and a week at Project Oceanology in Groton and she considered "whoever gets that prize is one lucky duck!" Lasya developed her project because she "wanted to do something that helped the environment and quickly came across bioplastics." Lasya was fortunate to have two mentors: Jon Neuhausel, the STEM theme coach at Westside Middle School Academy, who helped her with her research

and presentation, along with her science teacher, Beth Manning, who helped her with "the basics of creating a CSEF-worthy project." Lasya was thrilled to win the Urban School Challenge and as a result has decided she "will definitely pursue science as a career" because "I've fallen in love with science."

The 2016 Urban School Challenge second place middle school winner is eighth grader Jeffrey Osbourne. Jeffrey is also a student at Westside Middle School Academy. For his project, Harvesting Wind from Street Canyons Using a Double Helix Wind Turbine, Jeffrey was awarded \$200 and a trip to GENIUS Olympiad in Oswego, New York. This was Jeffrey's first time participating in the Urban School Challenge but not his first time participating in CSEF. In seventh grade, Jeffrey entered the fair with a project focused on wind power and urban street canyons. Jeffrey notes, "My first year was more of a study of the phenomenon and I did not make it into the top ten in seventh and eighth grade, therefore I didn't advance to states." In 2016, Jeffrey was invited to participate in the Urban School Challenge and used what he learned the year before to "harness this accelerated wind by building a special wind turbine that was multi-directional. I took the concept of a double

helix airfoil formation and modified it to my purposes and applied it to a street canyon." His greatest challenge was working with aluminum sheet metal and riveting it around the core; however Jeffrey received help from his school STEM Coach, Jon Neuhausel, who "helped me get my project going and fed me potential ways to use my project or even ways to branch off. He even helped me construct my project and register for the State Science Fair."

According to Rebecca Meyer, Connecticut Science & Engineering Fair Board Member and Urban School Challenge Judging Chair for 2015 and 2016, one of the most important aspects of the competition is the learning experience. The value of participation is in the process students experience to refine and improve their work. Students receive evaluations and feedback, and learn that failure is not something to fear, but a requisite for advancement in the scientific and engineering world. Meyer looks forward to 2017, when there will even more workshops for one-on-one learning, and students from the state's most disadvantaged schools will have the opportunity to discover their potential as young scientists and engineers. —**Wendy Swift, freelance writer**