

QUARTERLY NEWSLETTER

SPRING | 2024

UConn

RESEARCH

UConn AWARDED \$4.5M DOE GRANT TO BENEFIT GRID RELIABILITY FOR TRANSMISSION AND DISTRIBUTION SYSTEMS

The project team will create open-source data visualization tools to display information about renewable energy sources and distributed energy resources.

PHARMACY FACULTY ADVANCE FREEZE-DRYING TECHNOLOGY

Techniques developed at UConn are extending the shelf-life and potency of critical vaccines and other sensitive pharmaceutical products.

MEET THE RESEARCHER - Jessica Lubell-Brand, CAHNR

Jessica Lubell-Brand (MS '04, Ph.D. '08) specializes in native plant, propagation, and cannabis research. She's interested in helping gardeners and growers optimize plant fertility — and in thinking about how horticulture can reduce its environmental footprint.

MAPPING THE RESISTANCE AGAINST CHRISTIAN NATIONALISM

The Henry Luce Foundation has awarded UConn's Meanings of Democracy Lab \$300,000 to chart resistance to Christian nationalism.

HDFS RESEARCHER OFFERS 3 WAYS FOR EDUCATORS TO FOSTER BLACK GIRL MAGIC IN STUDENTS

'There's not a right way to have Black Girl Magic. Whatever it might be for you, it's something that needs to be celebrated'

TOP RESEARCH VIDEOS | RESEARCH BY THE NUMBERS

UConn STAFF RAISES AWARENESS FOR HUMANE BIOMEDICAL RESEARCH

UConn takes careful steps to ensure that all biomedical research is conducted safely and with integrity. On April 18, several members of the Office of the Vice President for Research (OVPR) were on hand during a celebration of their mission, complete with a live mascot who embodies responsible practices.

EMPOWERING UNDERREPRESENTED WOMEN IN SCIENCE

An awardee of 2022-2023 SPARK funding for technology commercialization, associate professor of chemistry Jessica Rouge is hoping to soon add "science entrepreneur" to her repertoire. In her lab and in her life, she is passionate about nurturing women in science.

NEW & NOTABLE FACULTY AWARDS





KEEPING THE LIGHTS ON - WITH RENEWABLE ENERGY

(Chris LaRosa/UConn Photo)

By Olivia Drake, UConn College of Engineering

THE PROJECT TEAM WILL CREATE OPEN-SOURCE DATA VISUALIZATION TOOLS TO DISPLAY INFORMATION ABOUT RENEWABLE ENERGY SOURCES AND DISTRIBUTED ENERGY RESOURCES

A project spearheaded by the University of Connecticut will help power grid operators nationwide revolutionize how renewable energy sources are integrated into the electrical grid.

On March 19, the Department of Energy awarded Lead Principal Investigator, Associate Director of the Eversource Energy Center and Assistant Professor of Electrical Engineering Zongjie Wang with a \$4.5 million grant (\$3,340,168 DOE and \$1,127,191 awardee costs share) to pursue this groundbreaking initiative, which focuses on developing a new “TRANSFORMATIVE” tool that will make significant improvements in power grid efficiency, reliability, and resilience to bounce back from disruptions, like severe weather events.



Zongjie Wang, assistant professor of electrical engineering and associate director of Eversource Energy Center, is Lead Principal Investigator for a project that will make improvements in power grid efficiency. (Chris LaRosa/UConn Photo)

“In the United States, the amount of electricity generated from renewable energy sources to supply the electric grid is continuing to increase,” Wang says. “Simultaneously, more electric customers are installing rooftop solar and battery energy storage systems. The accelerating integration of these resources can present complex challenges, but also bring opportunities that TRANSFORMATIVE will harness for both managing and operating the electric grid.”

The grant is among 11 projects to receive \$44 million in funding for tools to advance a clean, reliable electricity grid run on wind and solar energy. It also supports opportunities to streamline the interconnection of clean energy to the grid.

The Project’s Nitty-‘Grid’-y

An electrical grid consists of both a transmission and distribution system (T&D). Traditionally, the United States electrical grid is operated through the transmission system level, where large power plants—such as natural gas and coal—work to meet the energy needs of all consumers. In the current structure, grid operations only have visibility to the boundary of the distribution system with the local electric utility.

TRANSFORMATIVE, an acronym that stands for “Transmission and Distribution Systems with Flexible and Optimal Coordination: Resilience, Modeling, and Technologies for a Variable Renewable Energy Source and Distributed Energy Resources-Integrated Adaptive Energy

Grid,” showcases a strong and diverse collaboration among national research and development experts. This team includes experts from the University of Utah, South Dakota State University, Rochester Institute of Technology, and Raytheon Technologies Research Center, alongside strategic partnerships with Los Alamos National Laboratory, Southwest Power Pool, and Resource Innovations (former name Nexant). Ali Bazzi, associate professor of electrical engineering at UConn, is also co-PI on the project.

The goal of Wang’s project is to develop an open-source T&D coordination tool that integrates renewable energy output into existing operational software at grid operator control centers. These centers are known as independent system operators (ISOs). This innovative tool will be the first-of-its-kind to use data visualization to display information about variable renewable energy sources and distributed energy resources in electric grid control centers.

The initiative is set to conduct comprehensive simulations using real-world data from several regional grids, including five major ISOs—ISO New England, New York ISO, Southwest Power Pool, California ISO, and Midcontinent ISO—in collaboration with leading utility companies such as American Electric Power, National Grid, and Avangrid.

A diverse advisory group, encompassing more than 15 stakeholders from government agencies, utility companies, and the energy sector, supports the project. Wang’s extensive network, formed during her first two years at UConn and her postdoctoral studies at Cornell University and through her involvement in the North American Power Symposium (NAPS), has been instrumental in assembling this team. Her leadership will continue to be highlighted as she brings NAPS to UConn in 2025 as the general chair.

“Our goal is to create a smarter and more adaptive energy grid that can handle the increasing amount of renewable energy being generated, while also ensuring reliability and resilience in the face of challenges,” Wang says. “This work is critical in navigating the complexities of integrating renewable energy sources into the existing grid.” 🧪



PHARMACY FACULTY ADVANCE FREEZE-DRYING TECHNOLOGY

(Sean Flynn/UConn Photo)

By Matt Engelhardt, Office of the Vice President for Research and Taylor Graves, Pharmacy

TECHNIQUES DEVELOPED AT UCONN ARE EXTENDING THE SHELF-LIFE AND POTENCY OF CRITICAL VACCINES AND OTHER SENSITIVE PHARMACEUTICAL PRODUCTS

As critical as the need is to produce lifesaving vaccines, the capacity to cure viruses would be impossible if not for advanced methods of drug preservation such as freeze-drying. Through innovative techniques, professors Robin Bogner and Xiuling Lu are ensuring that biopharmaceuticals remain fully potent by the time they reach patients in need.

Bogner and Lu are both faculty members of the UConn School of Pharmacy. They have helped establish UConn as a leader in research and application into freeze-drying vaccines, antibiotics, natural enzymes and antibodies.

“As leaders in pharmaceutical innovation, our UConn School of Pharmacy’s faculty expertise in freeze drying opens new and wide-ranging possibilities in drug delivery,” says Philip M Hritcko, dean of the School of Pharmacy. “By harnessing this technology, we’re not just shaping the future of medicine; we’re revolutionizing how patients receive life-changing treatments.”

From the time they are developed, vaccines have a short time before they start to lose their potency. Freeze-drying preserves the products at their strongest, allowing them to be sent wherever they are needed.

“This is a very practical way to deliver injectable products,” Lu says. “Complex products such as vaccines are freeze-dried, sent out, then reconstituted before injecting them into patients.”

Pharmaceutical freeze-drying allows for long-term preservation of heat-sensitive drugs and biological materials. The process helps maintain the stability, efficacy, and

quality of the products, as it avoids the use of high temperatures that can cause degradation or denaturation.

Freeze-drying consists of three main steps. In the case of vaccines, first the solutions are frozen at a very low temperature, allowing the water to solidify. Next, pressure is lowered and heat applied to induce sublimation, enabling the frozen water to evaporate into a gas without passing back through the liquid phase. Finally, remaining water molecules that remain bound to the product are removed, accomplished through further increasing temperature and lowering pressure.

The second step, sublimation, takes several days to complete, which often leads to high manufacturing cost and increased financial burden on the healthcare system. The process demands careful temperature control. If sublimation takes place at a low temperature, the process is exceedingly long and expensive. However, if the product temperature rises above a critical temperature, the product quality can be compromised.

One challenge is that each product has a different critical temperature, which is often difficult to determine. Temperature cannot be measured directly during the manufacturing process without contaminating the product going to the patient. When a batch of thousands of vials of product fails, companies can only guess at how the product temperature changed to damage the batch.

UConn is leading the research in freeze-drying techniques. Bogner’s expertise

focuses on process control strategies. Meanwhile, Lu studies how the freeze-drying process affects stability of complex systems such as various types of nanoparticles, including mRNA lipid nanoparticles. Bogner and Lu have received substantial grant funding from the Department of Defense, National Institutes of Health, US Food and Drug Administration, and the Center for Pharmaceutical Processing Research. Major pharmaceutical companies are invested in their research as well.

“Industry sees us as a very strong partner committed to advanced manufacturing technologies,” Bogner says. “We serve as experts to consult with and help them improve their manufacturing processes and product quality.” 🧪

MEET THE RESEARCHER

JESSICA LUBELL-BRAND

Professor of Horticulture, College of Agriculture, Health, and Natural Resources

By Mac Murray, Office of the Vice President for Research

Jessica Lubell-Brand, who specializes in cannabis, native plant, and propagation research, is currently exploring a new growing technique that would make the horticulture industry more sustainable. Click here to watch.

https://www.youtube.com/watch?v=BFI_X5z0FnA





(Shutterstock)

By Mac Murray, Office of the Vice President for Research

THE HENRY LUCE FOUNDATION HAS AWARDED UCONN'S MEANINGS OF DEMOCRACY LAB \$300,000 TO CHART RESISTANCE TO CHRISTIAN NATIONALISM

Associate professor of sociology Ruth Braunstein has built her career exploring opposing political forces. Her first book, "Prophets and Patriots: Faith in Democracy Across the Political Divide," compared a conservative Tea Party chapter with a progressive faith-based group, examining how each understood itself to be "carrying forward the promise of the American democratic project." Her 2023 op eds in Religion News on House Speaker Mike Johnson and pluralist resistance to Christian nationalism garnered significant public

attention for the Meanings of Democracy Lab she directs at UConn. Now, Braunstein is taking her work on resistance movements formed in opposition to Christian nationalism to the digital sphere with a \$300,000 grant from the Henry Luce Foundation. In addition to maintaining a database of individuals and organizations involved in this resistance movement, her lab will be producing a documentary-style podcast following "some of the strange bedfellows that are involved in this resistance work." The podcast will be supplemented by an interactive web platform which will allow users to explore the full database of resistance efforts and spotlight even more individual stories. "It will help people get a sense of what these groups are really doing on the ground, to think critically, to educate themselves about what Christian

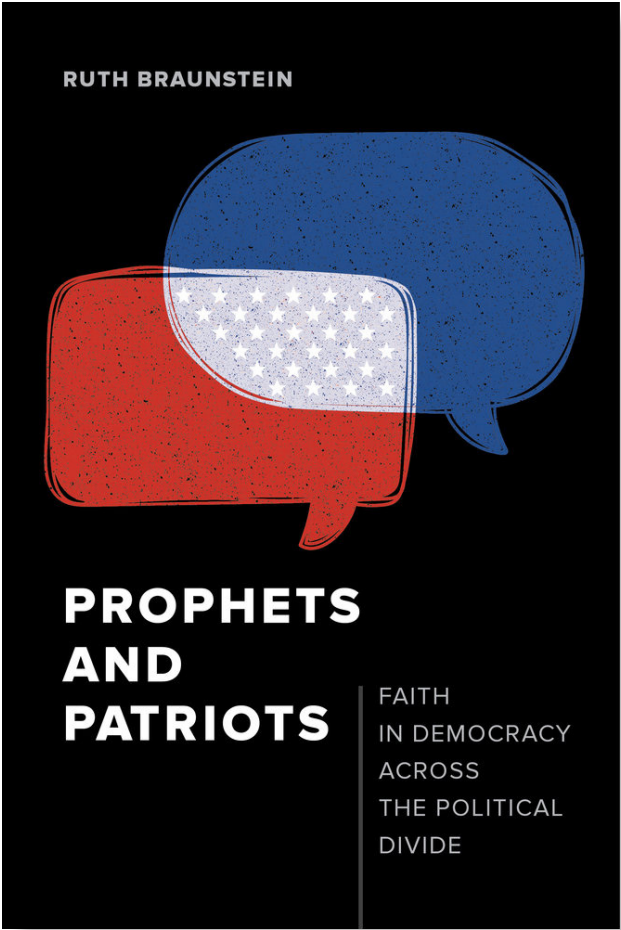


Ruth Braunstein is an associate professor of sociology at UConn and the director of the Meanings of Democracy Lab.

nationalism is, where it might be showing up in their communities, whether they think it's problematic and in what ways, and what a different vision of Christianity's role in American public life might be," Braunstein says. Christian nationalism has maintained roots in American soil since the nation's founding, and it continues to flourish. "Essentially, it's a mythological story about the United States ... that at its founding, the country was perfect, sacred, and created for and by Christians — and that in the years since the founding, the country has slowly fallen away from the original promise of the country," Braunstein explains. It also includes the idea that "that falling away has been both the fault of persons in the society and attacks by outsiders." Though Braunstein notes the country has not always lived up to its pluralistic ideals, she believes these ideals call Americans to create "a democracy where people of all religious faiths and no religious faiths are welcome to live in the way they choose — and not just welcome, but also part of the group of people who get to create that society." The resurgence of Christian nationalism in US politics has received a lot of media airtime, especially its role in violent events like the 2017 Charlottesville "Unite the Right" rally and the 2021 Capitol insurrection. But Braunstein urges us to look, instead, toward the quieter coalition-building taking place across the nation as people

join forces to combat the spread of this ideology. "I noticed that as Christian nationalism was gaining power and influence in American politics, it was also unleashing a wave of resistance," she says. That included the "usual suspects" — "liberal religious groups, legal defense groups" — who have been resisting Christian nationalism for decades, "but also included some new actors, including many conservative white Christians who were concerned about what Christian

nationalism meant for both American democracy and American Christianity." Her work explores the significance of this resistance for people from all walks of life. Everyone has a stake in determining the influence of Christian nationalism in American public life and policymaking, she says. "This really isn't a partisan battle, either, because there are people in every corner of our politics that have concerns about this for different reasons," she says, noting the well-documented links between Christian nationalism and racism, misogyny, Islamophobia, and nativism. People in churches and faith communities around the country "want to think hard about some of these questions, about their own privilege as white Christians, or their own barriers to inclusion as non-Christians or as non-white Christians. They want to be able to think about what the proper role of religion and Christianity in our politics, our public life, and policymaking is," Braunstein says. "Those are hard conversations to have, but ones that I think are essential, and that the folks who are doing this resistance work are having," she continues. "I hope that by lifting them up as diverse models for how to do this, other people might better understand how they could do that themselves."



Grant funding for this project comes from the Henry Luce Foundation's Religion and Theology Program, through an initiative seeking to "Advance Public Knowledge on Democracy, Race and Religion in America." The Henry Luce Foundation seeks to deepen knowledge and understanding in pursuit of a more democratic and just world. Established in 1936 by Henry R. Luce, the co-founder and editor-in-chief of Time, Inc., the Luce Foundation advances its mission by nurturing knowledge communities and institutions, fostering dialogue across divides, enriching public discourse, amplifying diverse voices, and investing in leadership development.

HDFS RESEARCHER OFFERS 3 WAYS FOR EDUCATORS TO FOSTER BLACK GIRL MAGIC IN STUDENTS

By Kimberly Phillips, University Communications

‘THERE’S NOT A RIGHT WAY TO HAVE BLACK GIRL MAGIC. WHATEVER IT MIGHT BE FOR YOU, IT’S SOMETHING THAT NEEDS TO BE CELEBRATED’

Several years ago, when Marketa Burnett asked the young Black girls who were part of her research study to talk about what it meant first to be a girl and second a Black girl, they told her the two were indistinguishable.

“They said they didn’t know what it means to be just a girl because they don’t have just girl experiences,” she says. “That really surprised me to see so plainly they were having a hard time even coming up with words to describe what it means to be a girl. They couldn’t separate that experience from being a Black girl.”

What’s more, Burnett says, one sixth grader told her about how teachers treated her differently and one refused to put her in an accelerated class despite her grades. The girl used the word “racism” to describe what was happening yet added she wasn’t planning to tell her parents because she didn’t want the situation to become a problem, almost protecting them.

“Black girls from an early age understand what’s happening to them and aren’t afraid to define it as sexism and racism,” says Burnett, an assistant professor in UConn’s department of human development and family sciences and Africana Studies Institute. “They also have a lot to say about what they need, and that’s one of the most exciting things I get to do as a researcher. I get to hear from our future changemakers about what they need to thrive.”

Through the lens of the 10-year-old Black Girl Magic movement, Burnett and four colleagues offer three suggestions for making K-12 learning spaces more conducive to Black girls and their learning needs, using suggestions straight from the source – the girls themselves.



“We believe all Black girls have magic within them, and it’s up to us to make sure we’re nurturing that, supporting them, and creating safe spaces for them to thrive.” (Adobe Stock)

Their study, “Black Girl Magic is everything: Recommendations for cultivating supportive spaces for Black girls,” was published online last month in Theory Into Practice.

Burnett explains that the hashtag #BlackGirlMagic was coined in 2013 by social media influencer CaShawn Thompson to uplift and celebrate the accomplishments of Black girls and women. Working toward this same goal, Burnett and her colleagues sought to develop suggestions for teachers, administrators, counselors, team leaders, coaches, and community members.

“Every Black girl has magic within her,” Burnett says.

Their first recommendation is for adults to consider the types of gender and racial messaging Black girls are exposed to and

ensure it not only is positive but also balances lessons in both preparation and empowerment.

“We know Black girls are aware of the stereotypes about them,” Burnett says. “We found that girls oftentimes are being affirmed and empowered at home, so they’re prepared when they experience racism and sexism in their daily lives. Those lessons of affirmation and empowerment need to continue in other places Black girls spend time.”

Secondly, they say, educators need to intentionally create spaces that encourage Black girls to feel a sense of belonging and support.

“Unfortunately, a lot of times Black girls feel as if they don’t belong in traditional school spaces or they have to completely change who they are and conform in order to be successful,” Burnett says. “If we as educators think more creatively about doing things outside the norm, we’ll find that Black girls will excel more.”

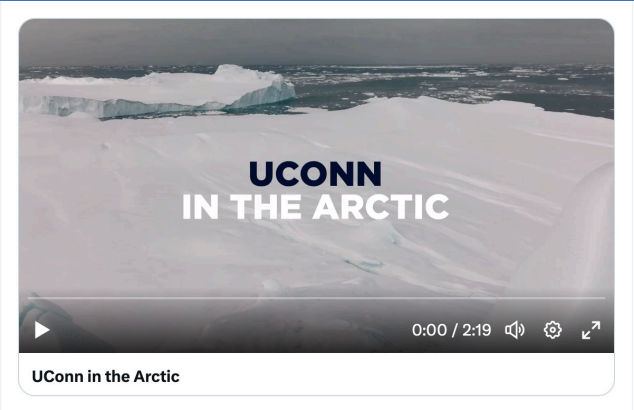
Black girls reported to Burnett and her colleagues that teachers often admonish them for being too talkative, when in fact they are working on a project as a group.

That’s the third recommendation from the group: valuing social relationships and understanding that learning doesn’t happen just when doing homework or a classroom activity.

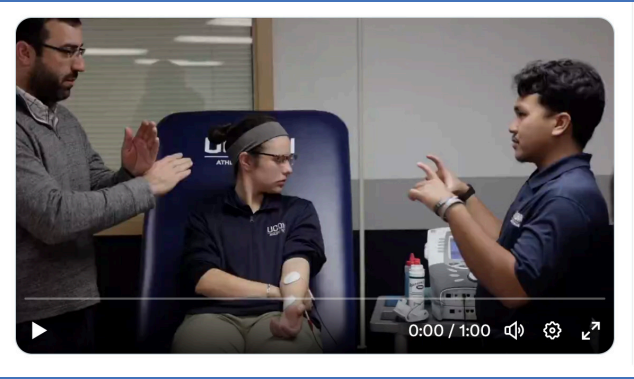
“We believe all Black girls have magic within them,” she says, “and it’s up to us to make sure we’re nurturing that, supporting them, and creating safe spaces for them to thrive. That’s what this paper is about, not just Black Girl Magic, but intentionally thinking about how to support the magic in all Black girls.”

TOP RESEARCH VIDEOS

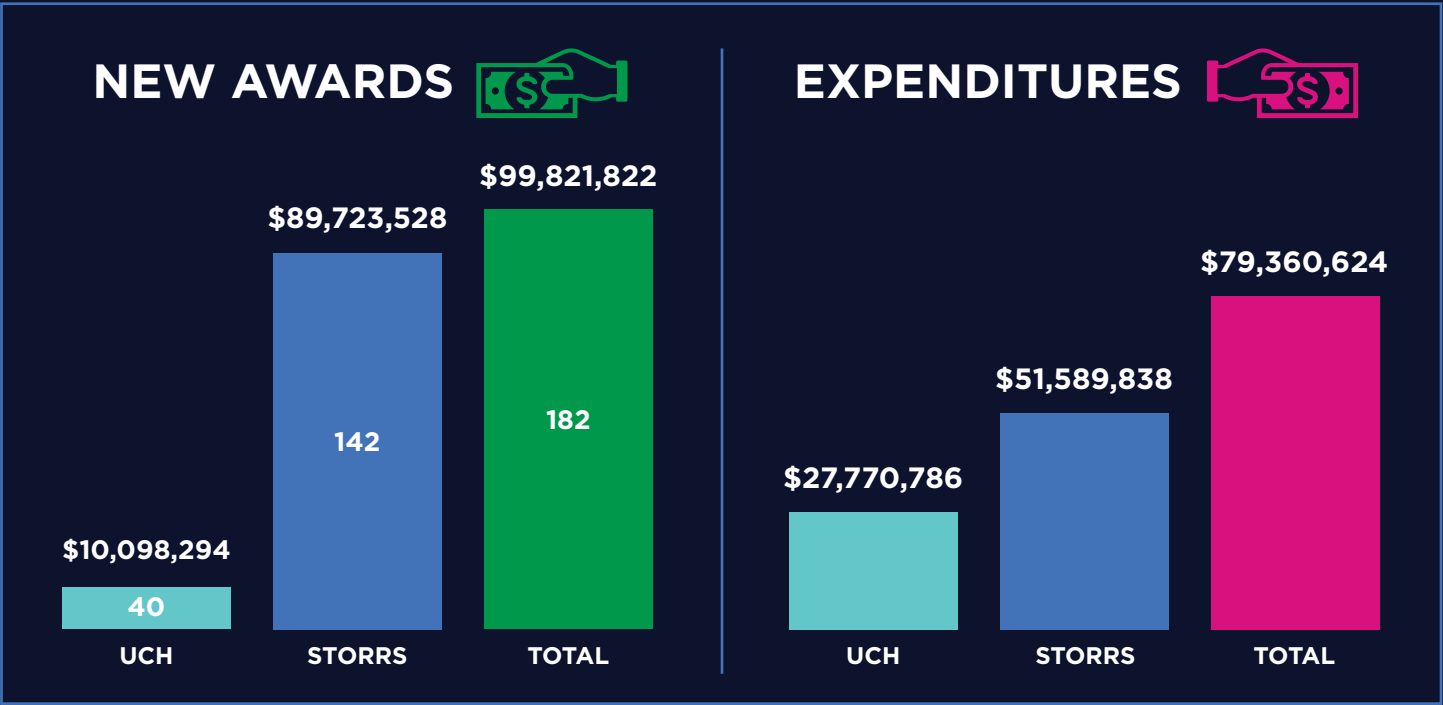
Last May, UConn researchers traveled to Arctic to learn more about sea ice expected to be extinct by 2040 – both to catalog what it holds and to gather clues about our future without it.



UConn’s Kinesiology Department was announced as 2nd in the United States according to the National Academy of Kinesiology’s most recent Doctoral Program Evaluation, boosting the department from its previous 3rd place ranking for its exercise science program.



RESEARCH BY THE NUMBERS FY2024 Q3 ONLY TOTALS



UConn Staff Raises Awareness For Humane Biomedical Research

By Matt Engelhardt, Office of the Vice President for Research

UConn Takes Part in the BRAD - Biomedical Research Awareness Day

UConn takes careful steps to ensure that all biomedical research is conducted safely and with integrity. On April 18, several members of the Office of the Vice President for Research (OVPR) were on hand during a celebration of their mission, complete with a live mascot who embodies responsible practices.

Biomedical Research Awareness Day (BRAD) takes place annually on the third Thursday in April. The observance allows UConn and other institutions to educate others on the important roles that animals and humans play in biomedical research.

Units within the OVPR's Office of Research Integrity and Compliance are dedicated to supporting biomedical research and promoting best practices. On that Thursday, the members of the unit, including the Institutional Animal Care and Use Committee and Animal Care Services hosted a booth on the Storrs campus to inform UConn students and staff. They also presented a webinar and held a reception.

"UConn regards the use of animals in research, teaching, and testing to be an integral component of continued progress in science, education, and agriculture," said Karen Moré, the director of research integrity and compliance. "We are committed to maintaining the highest standards of humane animal care, welfare, and regulatory compliance in our research and teaching endeavors and we expect our animal facilities and programs to maintain high ethical standards for animal care and use."

BRAD gave the team an opportunity to spotlight a furry retiree, Fenway the beagle. The dog was a former research subject, and his retirement is an example of the humane methods UConn championed during this BRAD day event.



Animal Care Services Program Manager James Brennan holds his beagle, Fenway, during a day to raise awareness about biomedical research. (Contributed photo from Animal Care Services)

UConn is accredited as an AAALAC institution, an international non-profit organization dedicated to humane treatment of animals in science. The

accreditation is internationally recognized as a signal of an institution's dedication to high quality, ethical programs of animal care and use. 🧪

Empowering Underrepresented Women in Science

By Joanna Smiley, UConn Technology Commercialization Services

AN AWARDEE OF 2022-2023 SPARK FUNDING FOR TECHNOLOGY COMMERCIALIZATION, ASSOCIATE PROFESSOR OF CHEMISTRY JESSICA ROUGE IS HOPING TO SOON ADD “SCIENCE ENTREPRENEUR” TO HER REPERTOIRE. IN HER LAB AND IN HER LIFE, SHE IS PASSIONATE ABOUT NURTURING WOMEN IN SCIENCE.



Jessica Rouge with the members of her lab (UConn Photo).

Before sunrise, Jessica Rouge used to leap out of bed in the glow of darkness and race to the Charles River with her teammates for crew practice. A few hours later, the future UConn associate chemistry professor would run back to Boston College for her morning science class: she was among a small group of female students pursuing a B.S. degree in biochemistry. Rouge still sprints, but in a different way: now, she doubles as teacher, mother to two toddlers, mentor to young scientists, hobby musician and soon she will potentially add another role to her repertoire: science entrepreneur. Rouge's lab group, which is more than 50 percent female, “seeks to understand how enzymes and nucleic acids can be used

in new ways to engineer highly specific and targeted responses in chemical and biological systems. Specifically, her team is interested in developing new chemical strategies for assembling catalytic RNA sequences at nanoparticle surfaces for sensing, diagnostic, and therapeutic applications.” Rouge was a 2022-2023 recipient of the SPARK Technology Commercialization Fund, a program that helps shepherd the process of translating invention to entrepreneurial success.

With the preclinical data she was able to secure using the Spark Fund resources,

Rouge is hopeful that she and her collaborators are close to licensing her technology. 🧪

NEW & NOTABLE FACULTY AWARDS

RESEARCH AWARDS >
\$1 MILLION, JANUARY - APRIL 2024

- PI: Rachel C. Cohen, CLAS**
CT Start Early Intervention Study
\$9,864,169
- PI: Richard Christenson, ENG**
NIJVT - Applied Research to Advance Current and Future Technologies in the Undersea Vehicle Domain (FY23)
\$8,254,817
- PI: Ravin Gorthala, ENG**
U.S. Department of Energy Onsite Energy Technical Analysis and Support Center (DOE OE-TASC)
\$7,979,346
- PI: Nancy S. Redeker, NUR**
Phenotypes of Sleep Health Among Black and Hispanic Women of Childbearing Age
\$3,448,918
- PI: Alexander C. Jackson, CLAS**
A Novel Trans-synaptic Adhesion Complex as a Regulator of Hypocretin/Orexin Control of Arousal
\$3,172,723
- PI: Morgaen Donaldson, ED**
Center for Connecticut Education Research Collaboration (CCERC) 2.0
\$3,000,000
- PI: Devin M. Kearns, ED**
Connecticut Intensive Intervention Implementation Initiative (CONNi4)
\$2,629,145
- PI: Anthony T. Vella, SOM**
How RNA binding proteins control effector T cell responses Award No. 1R01CA282775-01A1
\$2,441,126
- PI: Indrajeet Chaubey, CAHNR**
FY2024 Smith-Lever Capacity Grant
\$2,346,932
- PI: Baikun Li, ENG**
Developing a Digitization and Automation Platform for Reducing Greenhouse Gas Emissions from Biological Nutrient Removal Unit Processes in Water Resource Recovery Facilities
\$2,000,000
- PI: Heidi M. Dierssen, CLAS**
Exploring the Role of Phytoplankton Community Composition in Air-Sea Carbon Exchange West of the Antarctic Peninsula through Field and Satellite Measurements
\$1,721,357
- PI: Sina Shahbazmohamadi, ENG**
Modeling, Simulation, and Redesigning of Electron Optics Column for Secure Foundry's Multi Electron Beam Direct Write System (MEBDWS)
\$1,500,000
- PI: James O'Donnell, CLAS**
Environmental Characterization of the Long Island Sound - LIS Cable Fund Priority Area III (LISCF Mapping Phase IIIB)
\$1,425,798
- PI: Joseph Ercolano, BUS**
Small Business Development Center FY24
\$1,405,303
- PI: Rainer J. Hebert, ENG**
Comp 79: Microstructure control during additive manufacturing of Ni-Al bronze
\$1,055,001
- PI: Guillermo Risatti, CAHNR**
2023 ARP NAHLN funding
\$1,000,000

UConn
RESEARCH

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