

# RESEARCH & SCHOLARSHIP MATTERS

A PUBLICATION OF THE SENIOR VICE PROVOST FOR RESEARCH & GRADUATE EDUCATION,  
DR. CORINNE LENGSELD

What's inside this issue:

**SECURING THE  
POWER GRID**

**CAN CAPACITY BUILDING OF  
POTENTIAL RESPONDERS  
LEAD TO FEWER INCIDENTS  
OF MASS KILLINGS IN  
COLORADO AND BEYOND?**

**INCREASING LATINX  
PRESENCE IN THE GREATER  
ENGINEERING COMMUNITY**

**COULD SPONGES HELP  
ANSWER LONG-  
STANDING QUESTIONS  
ABOUT EVOLUTION?**

## EARLY INTERVENTION AND TREATMENT FOR DS & AD

**AURÉLIE LEDREUX, DANIEL PAREDES &  
LOTTA GRANHOLM-BENTLEY**



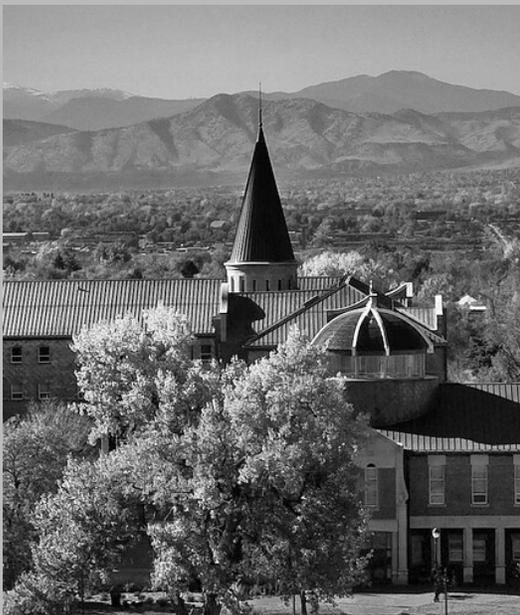
An estimated 350,000 Americans are living with Down syndrome (DS). Down syndrome, also known as Trisomy 21, is a genetic disorder caused by the presence of three copies (instead of the usual two copies) of chromosome 21. Medical advances have led to an increased life expectancy in individuals with DS, with an average life span close to 60 years of age.

However, people with Down syndrome have a greatly increased risk of developing dementia and Alzheimer's disease (AD), and signs and symptoms may begin around age 40. The team's preliminary data indicates that markers of AD could be present as early as eight years of age. Therefore, preventative treatments could be initiated early in life, helping to avoid onset of AD and allowing for a longer, healthier life.

However, little is known about the biological mechanisms leading to memory impairment and dementia in individuals with Down syndrome. Dr. Ledreux's research is focused on a specific area located in the back of the brain called the locus coeruleus (LC) which degenerates early in AD and in DS-AD. The LC is responsible for producing the neurotransmitter norepinephrine (NE), a chemical essential to memory as well as attention focus. It is well known that the early loss of LC neurons observed in DS and DS-AD is detrimental to memory and cognition.

In a recent five-year grant awarded from the National Institutes on Aging, Dr. Ledreux and colleagues will examine the consequences of the loss of LC neurons on neuropathology, vascular changes, and memory loss in animal models of DS. Such knowledge could translate in potential treatment avenues for individuals with DS and DS-AD.

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# IN THE NEWS

*From January through March, the University of Denver garnered 49 mentions in elite and national media outlets, and 134 mentions in local media outlets.*

**KOA Radio** - "Hospitality Industry Still Faces Challenges Amid Pandemic," interview with David Corsun, associate professor and director, Fritz Knoebel School of Hospitality Management

**New York Times** - "The Next Trick: Pulling Coronavirus Out of Thin Air," quotes from Alex Huffman, associate professor, NSM

**CBS 4 & The Denver Gazette** - Coverage of the University of Denver & National Jewish Health Valentine's Day vaccine event to support communities with less access to vaccines

**CBS Evening News** - "Johnson & Johnson Requests U.S. Authorization for Its One-Dose COVID Vaccine," mentions DU's antibody test

**The New York Times** - "How Meghan Markle Has Already Changed the Way We Talk About Suicide," op-ed by Stacey Freedenthal, associate professor, GSSW

**Newsweek** - "Trump Failed to Deliver for Evangelicals in Supreme Court Abortion Case," opinion from Joshua Wilson, associate professor, CAHSS

**FOX 31** - "Images of US Capitol Attack Produce Disgust and Distress," quotes from Gwen Mitchell, associate professor, GSPP

**Denver Post** - "Experiencing Trauma from Storming of U.S. Capitol is Normal -- Even If You Weren't There, Experts Say," quotes from Apryl Alexander, associate professor, GSPP

**Associated Press** - "For A Splintered Nation, A Delicate Moment Of Continuity," quotes from Susan Schulten, professor, CAHSS

**Denver 7** - "President Biden Signs 15 Executive Orders on His First Day in Office, from COVID Response to Climate," quotes from Mac Clouse, professor, DCB

**U.S. News & World Report** - "6 Changes for Your Finances Under President Biden," quotes from Ron Throupe, associate professor, DCB

# SECURING THE POWER GRID

**AMIN KHODAEI & ROZHIN ESKANDARPOUR**



So much of our daily lives depend on a secure and stable electrical power grid. Recently, the power outage in Texas due to a major winter storm reminds us just how much. It is also one of many examples of how climate change can impact the physical security of the grid. As climate change continues to develop, decades-old solutions are no longer working and new ones must be invented to ensure the grid remains reliable.

Through funding from the Colorado Office of Economic Development and International Trade, PIs Amin Khodaei, Professor of Electrical and Computer Engineering, and Rozhin Eskandarpour, the CEO of Resilient Entanglement and a DU alum, have come up with a possible solution utilizing quantum models and quantum mechanical phenomena. Though computation has been crucial to electric power grid management through history, grids are being continuously upgraded, making them more complex with more data to process. New classes of models, algorithms, and solutions are needed.

Using quantum computing, the team has already worked toward a solution to one of the most fundamental power system problems - power flow, which is a numerical analysis based on the physics of the grid. It is the keystone of electric utilities' decision making in grid operation, control, and planning. Initial studies by the team, conducted on a test system, showed a potential speedup of over 30 times compared to that of a classical computer. This would ensure a faster grid recovery and shorter power outage for residents in disaster areas, helping to save lives, restore power, and ensure communication within the community.

Next steps are for the team to develop and test a product using quantum computing with the goal of helping secure the power grid's stability and fulfill this crucial need for society.

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# CAN CAPACITY BUILDING OF POTENTIAL RESPONDERS LEAD TO FEWER INCIDENTS OF MASS KILLINGS IN COLORADO AND BEYOND?

MARIA VUKOVICH

Since 1993, there have been seven mass killings of three or more people as a result of targeted violence in Colorado. These tragedies include shootings at Boulder King Soopers (2021), Thornton Walmart (2017), CO Springs Planned Parenthood (2015), Aurora Theater (2012), Arvada and CO Springs Churches (2007), and Columbine High School (1999).

In addition to the lost lives, thousands of people have been deeply affected as survivors of these tragedies. Relatedly, there has been a recent uptick in local extremist activity and those in danger of radicalization. According to the Anti-Defamation League's ADL H.E.A.T. (hate, extremism, anti-Semitism and terrorism) map, there have been 344 incidents in Colorado since 2018.

Violent extremism and targeted violence can be linked to a wide range of pre-criminal behaviors and is often tied to personal angst. For example, school counselors may hear a student mention something that sounds extreme or on



the pathway to violence – making them a danger to others or themselves.

Hospitals, social services, mental health centers, and law enforcement (among others) may become aware of concerning cases, yet be unsure of next steps. The Colorado Resilience Collaboration (CRC) – an initiative within GSPP's International Disaster Psychology: Trauma and Global Mental Health Program – exists to fill these gaps.

The CRC's mission is to equip potential targeted violence responders by building the knowledge and skills for acting to disrupt and reduce the incidence of targeted violence. The work of the CRC is focused on

comprehensive education, expert clinical consultation, and rigorous interdisciplinary research for targeted violence prevention. The CRC implements education, consultation and research in collaboration with local, state, and federal stakeholders to strengthen the existing skills and capacities already at play in urban and rural communities of Colorado.

Through funding from the U.S. Department of Homeland Security – Terrorism and Targeted Violence Prevention Program, CRC is delivering training and consultation interventions to thousands of potential responders, and developing an online resource library for open access knowledge sharing and technical assistance through 2022. Utilizing this collaborative capacity building approach, the CRC aims to bridge the knowledge and resource gaps that potential responders often face and sustain lasting targeted violence prevention efforts across the State.

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# INCREASING LATINX PRESENCE IN THE GREATER ENGINEERING COMMUNITY

PAT GARRIOTT



The Latinx presence in engineering has steadily declined since the 1970s. Currently, Latinos are only 6% of the engineering workforce, while Latinas represent just 1%. Through previous studies, students' and young professionals' experiences have been identified as a major factor.

In these studies, Latinx students reported a positive undergraduate experience overall, however, they faced issues around sexism and exclusion. Early career professionals reported similar exclusion and discrimination in the workplace. During such a critical period for early career Latinx engineers - especially women - these experiences can lead them to question if engineering is the right field for them.

This study will follow a group of Latinx engineers five to nine years after graduation with surveys and weekly check ins. Through this process, Dr. Garrriott and his team will identify what deters Latinxs from staying in the

field and illuminate promising and best practices for retention. The hope is to be able to take these findings to higher education and workplaces so that Latinx students and early career professionals are prepared before entering the workforce and supported while in it. Another focus of this study will compare orientation to mainstream culture and orientation toward Latinx culture and what that means for students depending on their race and gender, as well as how it can serve as a persistence anchor.

With the information gathered from this project, the hope is to increase the number of Latinxs in the engineering workforce; identify inclusive workplace conditions, policies, and practices; and reduce systemic barriers to the persistence of Latinxs in engineering.

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## SELECT RECENT GRANTS AWARDED

**Director Samantha Galvin**

**(Low Income Tax Clinic, SCOL), \$200k**

Grant from the Internal Revenue Service for "Low Income Taxpayer Clinic 21-23"

**Professor Cullen Hendrix (JKSIS), \$47k**

Grant from Hiroshima University for "Cross Appointment with Hiroshima University"

**Senior Program Associate Brenda Lockwood (Butler), \$55k**

Grant from the State of Minnesota (subaward DHS) for "MN Supervisor Coaching for CWTS"

**Assistant Professor Xin Fan (NSM), \$395k**

Grant from the National Science Foundation for "CAREER: Unlocking New Spin-Charge Conversion in Symmetry-Broken Systems"

**Director Elysia Clemens (CEAL), \$390k**

Grant from the Center for Policy Research for "Building a Sustainable and Replicable Approach to Estimate Youth Homelessness with the Linked Information Network of Colorado (LINC)"

**Research Associate Professor Kevin Morris; John Geldhof & Megan Mueller (IHAC), \$237k**

Grant from the Greater Kansas City Community Foundation for "Green Chimneys Study"

**Dean Karen Riley & Clinical Associate Professor Jeanine Coleman, (MCE), \$129k**

Grant from the University of California-Davis (sub award NIH) for "A Cognitive Test Battery for Intellectual Disabilities"

**Associate Professor Scott Barbee, (NSM), \$295k**

Grant from the Department of Defense for "Dysregulation of RNA transport granules in the pathophysiology of Fragile X Syndrome"

**Professor Kimberly Bender (GSSW), \$25k**

Grant from Karis, Inc., for "Development and Implementation of a Study Examining: Outcomes Associated with Permanent Supportive Housing, Cost Benefit Analysis, and Experiences of Young People Living in Permanent Supportive Housing Community"

**A full list of recently awarded grants can be found:**

- [January 2021](#)
- [December 2020](#)
- [November 2020](#)

# COULD SPONGES HELP ANSWER LONG-STANDING QUESTIONS ABOUT EVOLUTION?

SCOTT NICHOLS

Imagine if one animal held some of the answers to long-standing questions about evolution. How did humans and all other living beings evolve over time from one universal unicellular ancestor? Believe it or not, sponges may be the key to some of these answers.



Why sponges? Sponges belong to one of the most divergent animal lineages, having evolved separately from all animals 600-800 million years ago. In fact, jellyfish and humans are more closely related to one another than either is to a sponge. Because of this distant separation, any characteristic shared between a sponge and another animal can be an assumed shared ancestral trait. Sponges lack muscles, neurons, a digestive gut, clear body axes and symmetry, and - until recently - were

thought to be lacking tissues. If the body organization, developmental patterning, and tissue physiology of sponges can be understood, it would go a long way to understanding early animal evolution.

The focus of this study is on the organization of sponge tissues relative to epithelia in other animals, and how cell adhesion integrates with self-nonself recognition mechanisms. These topics are central to understanding the cellular and physiological innovations that evolved to maintain

multicellular integrity in the animal stem lineage. There are two different mechanisms and approaches to cell adhesion in sponges: the aggregation factor (AF) model and the cell junction-based model. It was previously thought the aggregation factor model was primary, but this study will examine if there is a way to reconcile these models by characterizing the molecular composition of the AF in diverse sponge lineages, its subcellular distribution relative to cell junction proteins, and test whether these different adhesion mechanisms are functionally integrated.

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## CONGRATULATIONS!

**GREGO PENA CAMPRUBI  
& PADRAIC FITZGERALD**



JDP students Grego Pena Camprubi and Padraic Fitzgerald were recently awarded the Frieda Sanidas Leason and Bernard V. Leason European Union Scholarship. The \$2,500 scholarship will provide stipends for deserving college students from the Rocky Mountain West Network to participate in unique EU learning experiences.

Grego is a second-year PhD student and will focus on the lived experiences of LGBTQ+, Catholic Spaniards and Padraic is a dissertation-stage student, working on Norse neo-Paganism from a material religion / sound studies lens.

# ABOUT THE PUBLICATION

Research and Scholarship Matters is a quarterly newsletter produced on behalf of the faculty of the University by the Senior Vice Provost Provost for Research and Graduate Education. Faculty with notable accomplishments or images suitable to the front panel of the next issue are encouraged to send them to [Audry.LaCrone@du.edu](mailto:Audry.LaCrone@du.edu). Not all submissions can be included, but every attempt will be made to be inclusive of all high quality research, scholarship & creative works.

Previous issues can be found [here](#).

# WANT MORE INFORMATION?

Want to receive emails regarding resources, celebrations, opportunities, and upcoming deadlines related to research and scholarship?

Join the DU-Research listserv, please email: [orspadmin@du.edu](mailto:orspadmin@du.edu).