ARCS ADVANCING SCIENCE IN AMERICA®
SAN DIEGO CHAPTER

ACHIEVEMENT REWARDS FOR COLLEGE SCIENTISTS

SCHOLARS' PROFILES
2025-2026


ARCS
ADVANCING
SCIENCE
IN AMERICA®

ACHIEVEMENT REWARDS FOR COLLEGE SCIENTISTS

SAN DIEGO CHAPTER

san-diego.arcsfoundation.org

ARCS MISSION

ARCS® Foundation, Inc. advances science and technology in the United States by providing financial awards to academically outstanding U.S. citizens studying to complete degrees in science, engineering and medical research.

WHO WE ARE

October 4, 1957 was a game-changer. On that date, Russia launched Sputnik, a 183-pound spaceship, roughly the size of a beach ball, into space. This surprise launch shocked the United States and forced it to rethink its place as the technological leader of the world. It also ushered in the Space Age and the Cold War. The Russian action touched all areas of America, including politics, patriotism, science, the military, and education. In response, the U.S. undertook an unprecedented push to educate Americans in science and math.

As part of that initiative, a group of women in Los Angeles saw the opportunity to make a difference by creating a partnership between science and society. Their goal was to re-establish and re-energize the technological superiority of the United States. They started the first ARCS Foundation chapter in September 1958. ARCS (Achievement Rewards for College Scientists) is a nationally recognized nonprofit organization founded and administered by women who support American leadership and aid advancement in science and technology, now comprised of 15 chapters across the nation.

In 1985, four San Diego women established ARCS Foundation San Diego: Karen Bowden, Karon Luce, Barbara McColl, and Pattie Wellborn. Forty-one years later, ARCS San Diego has provided over $13.3 million in financial awards to the brightest STEM scholars at four local academic institutions. By investing in these scholars, we are securing a better future for America and the world.

BOARD OF DIRECTORS

President	Leslie Bruce
President Elect	Ingrid Benirschke-Perkins
Vice Presidents	
Administration	Paulette Roberts
Finance	Janet Roemer
Fund Development	Kristin Boyd
Marketing & Communications	Barbara Bry
Meetings & Social Events	Rachel Collins
Membership	Tamia Strachan
University Relations	Cathie Atkins
Recording Secretary	Grace Miller
Parliamentarian	Cindy Goodman
Member-at-Large	Margaret Dudas
Member-at-Large	Linda Johnson

UNIVERSITY RELATIONS COMMITTEE LIAISONS

San Diego State University | Tanya Schierling
Scripps Research | Catie Madani
University of California, San Diego | Sue Kalish, Pam Werner
University of San Diego | Caroline Etland
Editor, Scholar Profiles | Alice Brown
Scholar Alumni Relations | Alexa Hudnut
Site Visits | Cathie Atkins
Getting to Know You Program | Suzanne Dixon

SAN DIEGO CHAPTER

MEMBERSHIP

2025-2026

Kathe Albrecht (AC)
Nancy Anderson (E, C)
Sharon Arbelaez (AC)
Barbara Arledge (E, C)
Leila Armstrong (AC)
Cathie Atkins (AC)
Jill Baltan (AC)
Barbara Baxter (AC)
Ingrid Benirschke-Perkins (AC)
Betty Beyster (E)
Susan Barbey Booth (AC)
Karen Bowden (E, F, LS)
Kristin Boyd (AC)
Alice Brown (AC)
Leslie Bruce (AC, LS)
Barbara Bry (AC)
June Chocheles (AC)
Rachel Collins (AC)
Andrea Correnti (E, LS)
Kelsey Dale (AC)
Adela de la Torre (H)
Martha Dennis (AC)
Suzanne Dixon (AC)
Barbara Doren (AS, LS)
Kim Doren (AS, LS)
Susan Dramm (AC, C)
Margaret Dudas (AC)
Toby Eisenberg (AC)
Carolyn Elledge-Baker (E)
Doris Ellsworth (E, LS)
Becki Etess (E, LS)
Caroline Etland (AC)
Jane Fetter (AS, C)
Mary Fitz (E, LS)
Karen Fontana (E)
Dottie Georgens (E, C, LS)
Cindy Goodman (AC)
Peggy Hanley (AS)
Teri Harrah (AC)
Kelly Hartshorn (AS)
Holly Heaton (AS)
Ann Hill (E)
Sandra Fleet Honnen (HE)
Alexa Hudnut (AC)
Coley Hunt (AS)
Sue Hylton (AC)
Danielle James (AC)
Linda Johnson (AC)
Susan Johnson (AC)
Sue Kalish (AC)
Thespine Kavoulakis (H)
Joy Kirsch (AC)
Candace Kohl (AS)
Margaret Leinen (H)
Nicola Green Lerner (H)
Robin Luby (AC)
Catherina Madani (AC)
Deborah Mandabach (AS)
Laura Mateo (AS, T)
Barbara McColl (E, F)
Gloria McColl Powell (AS, C)
Grace Miller (AC)
Kimberly Miller (E)
Helga Moore (AC, LS)
Ellen Moxham (AS)
Priscilla Moxley (E)
Mary Mulvihill (E)
Sheryl Nespor (AC)
Toni Nickell (HE)
Sally Oxley (AC)
Marti Panarisi (E, LS)
Lisa Perich (AC)
Mary Lou Quick (AS)
Paulette Roberts (AC, LS)
Laurie Roeder (AC)
Janet Roemer (AC)
Nancy Rudolph (AC)
Erica Ollmann Saphire (H)
Tanya Schierling (AC)
Carolyn Sharp (AC)
Janice Shaw (AC)
Marla Shepard (AS)
Ann Siemens (AC)
Betty Simm (HE)
Jane Smith (E)
Barbara Starkey (AC)
Tamia Strachan (AC)
Steffanie Strathdee (AS)
Elizabeth Taft (AS, LS)
Karen Tartre (AS)
Gwynn Thomas (AC)
Greta Treadgold (AC)
Bobbie Vandervoort (E, T)
Meera Venkatesh (AC)
Yolanda Walther-Meade (E)
Pattie Wellborn (E, F)
Pam Werner (AC)
Nicola Wilkins-Miller (AC)
Gayle Wilson (HE)
Cindy Wollaeger (AC)
Britt Zeller (AC)

Active: AC | Associate: AS | Emeritus: E | Founding: F | Honorary: H | Honorary Emeritus: HE | Legacy Society: LS | Transfer: T

ARCS ADVANCING SCIENCE IN AMERICA®
SAN DIEGO CHAPTER

2025-2026 SCHOLARS
SAN DIEGO CHAPTER

The San Diego chapter of ARCS began in 1985 and has grown from the original four founders to 100 members today. As we enter our 41st anniversary year, we have made awards totaling over $13.3 million. Our academic partners are:

San Diego State University | Scripps Research

University of California San Diego | University of San Diego

ARCS Scholars are selected by their institutions in recognition of their achievements and their exceptional promise to contribute significantly to their fields. Basic requirements have been established by ARCS® Foundation, Inc.: Scholars must be U.S. citizens, have at least a 3.5 GPA, and they must be enrolled full-time in academic degree programs in science, technology, engineering, math, and biomedical research. Awards are $10,000, unrestricted, and renewable for three years. The San Diego chapter focuses on supporting students in doctoral programs, and the ARCS Scholars we have funded have a 98% graduation rate. For the 2025-2026 academic year, the San Diego ARCS chapter has awarded $500,000 to 50 Scholars.

SUMMARY

ARCS Foundation - San Diego Chapter 2025-2026 Scholars

Navigate document by clicking on the Scholar NAME or click to the section by clicking on an INSTITUTION

SAN DIEGO STATE UNIVERSITY

Kian Bagheri - Civil and Environmental Engineering
Genesis Barzallo - Global Health
Elizabeth Morgan Becker - Ecology
Brittany Michelle Conley - Biochemistry
Emily Anne Darin - Molecular and Marine Biology
Morgan Venness Farrell - Cell and Molecular Biology
Gregory James Jordan - Biology
Dennis Dimitri Krutkin - Bioinformatics
Amanda Nancy Lee - Computational Science
Nancy León-Rivera – Biomedical Sciences
Christina Rodama Veziris - Clinical Psychology

SCRIPPS RESEARCH

Stephan Miguel Freeman - Chemistry
Diego Daniel Gomez-Ceballos - Molecular and Cellular Biology
Anthony Harout Gurunian - Biophysics
Catherine Yicong Li - Biomedical Sciences
Pierre Phillip Loch-Temzelides - Chemistry
Karenna Minyun Ng - Immunology
Ariana Sulpizio - Biomedical Sciences
Madison Fay Wagner - Chemistry
Drason Han Zhang - Chemistry

UNIVERSITY OF CALIFORNIA SAN DIEGO

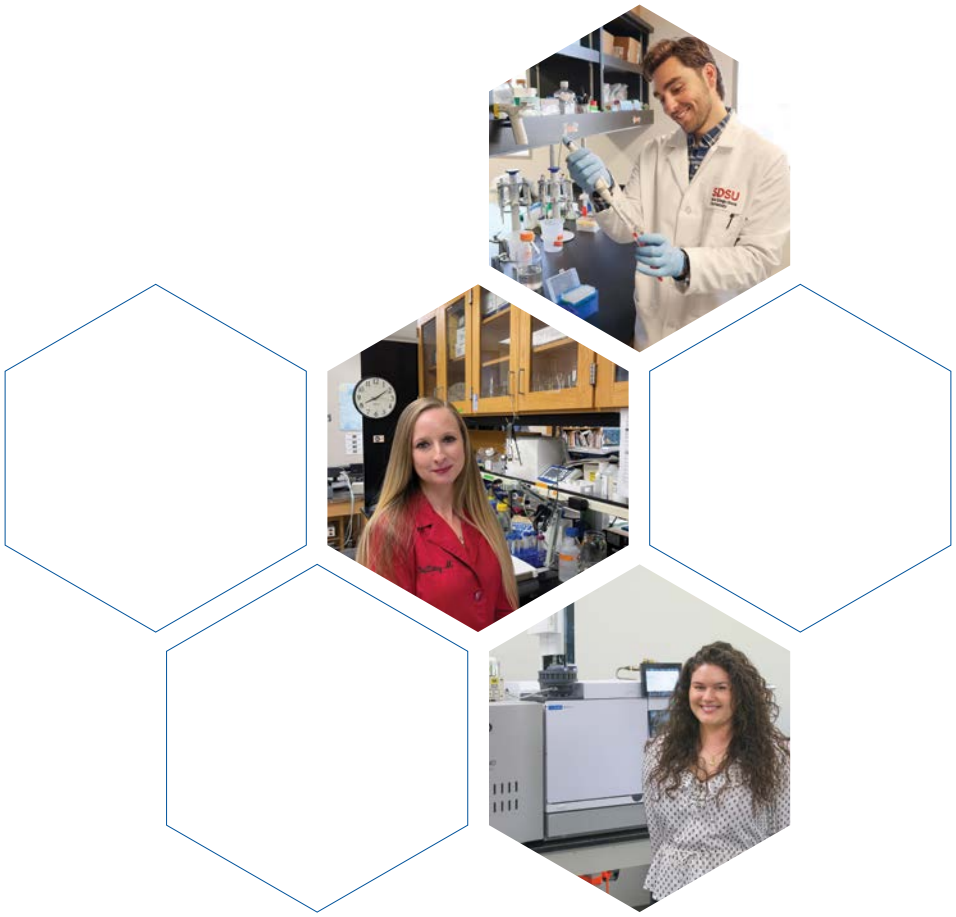
Rimjhim Agarwal - Biomedical Sciences
Hannah Rose Battey - Public Health
Daniel Milgram Beaglehole – Computer Science and Engineering
Morgan M. Caudle - Clinical Psychology
Kayla M. Erler - Structural Engineering
Dane Ford-Roshon - Biomedical Sciences
Wilfredo Gabriel Gonzalez Rivera - Biomedical Informatics
Rayyan Mohammed Gorashi - Bioengineering
Jonathan A. Gunn - Bioengineering
Dylan Cole Hirsch - Mechanical Engineering
Katherine Eugenia Izhikevich - Computer Science
Sarah Lane Ko - Materials Chemistry
Benjamin Aaron Lam - Chemical Engineering
Araz Majnoonian – Global Health
Daniel Milshteyn - Chemistry and Biochemistry
Spencer Louis Nelson - Biochemistry and Molecular Biophysics
Renny Ka Hang Ng - Biological Sciences
Renee Elizabeth Oles - Biomedical Sciences
Avery Pong - Bioinformatics
Natalie Elaine Quach - Biostatistics
Jared Simmons - Biomedical Sciences
Chesson Scott Sipling - Physics
Noah Stapper - Clinical Psychology
Lauren Alexandria Valdez - Neurobiology
Brandon James Vogt - Bioengineering
Olivia Jade Weng - Computer Science and Engineering

UNIVERSITY OF SAN DIEGO

Basma Adams - Nursing
Sandy Jean Jellen - Nursing
Kristina Maria Lopez - Nursing
Jessica Lee Ritchie – Nursing

SDSU | San Diego State University

The San Diego State University doctoral programs here are offered jointly with either the University of California Davis, the University of California San Diego, the University of California Irvine, or the University of California Riverside as noted in the Scholars' profiles.



KIAN BAGHERI

San Diego State University / University of California San Diego

College of Engineering

Concentration: Civil and Environmental Engineering

Specialization: Stormwater Management

Donor: Donald C. and Elizabeth M. Dickinson Foundation

Kian utilizes computer modeling to study the impacts of stormwater on urban and natural systems. His research focuses on a range of stormwater management applications from quantifying pollution generation to mapping flooded areas. Within his stormwater models, he has estimated trash mobilization by stormwater, the benefits of rainwater harvesting through a life cycle assessment, the impacts of climate change on drainage systems, and transborder water management issues. These topics help support management strategies to mitigate the adverse effects of high quantities of stormwater runoff.

Degree: B.S. in Environmental Engineering, San Diego State University

Awards and Honors: NSF International Research Experiences for Students 2023; COAST Field Experiences Support Program 2022; Undergraduate Summer Research Program 2019.

Publications, Papers, and Posters:

Barnes, Austin, Mark Merrifield, **Kian Bagheri,** Morgan Levy, Hassan Davani, "Flooding Projections due to Groundwater Emergence at Imperial Beach, California." *AGU Earth's Future*.

Kian Bagheri, Hassan Davani. "An integrated framework for stormwater management and life cycle assessment of rainwater harvesting: A comparative study of two underserved communities." *Science of the Total Environment 956* (2024): 177220. https://doi.org/10.1016/j.scitotenv.2024.177220

Sangsefidi, Y.; **Bagheri, K.**; Davani, H.; Merrifield, M. Data analysis and integrated modeling of compound flooding impacts on coastal drainage infrastructure under a changing climate. Journal of Hydrology. 2023, DOI:10.1016/j. jhydrol.2022.128823

Bagheri, K.; Davani, H.; Biggs, T.; McMillan, H. Hydrodynamic Simulations for Trash Loading in Southern California's Dense Urbanized Watersheds. J*ournal of Environmental Engineering*. 2023, DOI: 10.1061/JOEEDU.EEENG-7474

Current Research (expanded description): In urban areas, impervious surfaces generate large quantities of stormwater runoff during rain events, leading to flooding in low-lying areas and transporting pollutants into waterways. My work focuses on modeling urban drainage systems through numerical stormwater simulations. My research estimates the pollution carried by stormwater while also exploring methods to reduce both stormwater flow and pollution. I focus on implementing Green Infrastructure (GI) as an alternative to traditional 'grey' systems, which are designed to drain cities quickly. Green methods promote stormwater infiltration within urban areas, reducing runoff and mitigating flooding. Through modeling and simulations, I analyze how these green solutions can decrease overall pollution and flooding. While green infrastructure is beneficial, it still has environmental costs, such as material resources and greenhouse gas emissions. To assess this, I use life cycle assessments to determine the overall cost-benefit ratio of different green strategies. Additionally, my research evaluates how climate change, particularly sea-level rise, will impact drainage systems. I explore potential risks like saltwater and groundwater intrusion and quantify the additional inputs of water into the drainage system either from ocean backflow or infiltration into cracked and leaky pipes. Additionally, I analyze how rainfall intensification and increased storm frequency will impact existing drainage systems.

Benefits to Science and Society: The expected benefit of my research is to provide comprehensive information to both researchers and the public about the potential impacts of stormwater, and how best to mitigate these effects now and in the future. My work helps societies make more informed decisions when selecting solutions for various stormwater-related issues. Additionally, my research seeks to support historically disadvantaged communities by emphasizing the need to update infrastructure in areas that disproportionately experience adverse effects from stormwater.

Personal Interests: I enjoy hiking, biking, fishing, rock climbing, scuba diving and other activities that allow me to be in nature.

GENESIS BARZALLO

San Diego State University / University of California San Diego

College of Health and Human Services, School of Public Health

Concentration: Global Health

Specialization: Analytical Environmental Chemistry and Exposure Science

Donor: Robin Luby

What if a simple wristband could track invisible pollution? Genesis is developing a method that turns silicone wristbands into wearable samplers, detecting pesticides and smoke-related pollutants in daily life. Her research shines light on exposures linked to agriculture, wildfire smoke, and household air. By making hidden health risks visible, Genesis's work helps protect vulnerable communities and expands scientific understanding of how pollutants affect people's health.

Degree: M.S. in Analytical and Physical Chemistry, California State University, Los Angeles; B.S. in Biochemistry, California State University, Los Angeles

Awards and Honors: NIH ALIADOS T32 Fellowship, San Diego State University, 2025; Cornelius Hopper Diversity Supplement, Tobacco-Related Disease Research Program, 2024; University Graduate Fellowship, San Diego State University, 2024; AC/DC Rising Star in Analytical Chemistry, American Chemical Society, 2023.

Publications, Papers, and Posters:

Barzallo, G. Applying LC-QQQ pesticide analysis to silicone wristband samplers for assessing children's exposure to secondhand tobacco, e-cigarette, and cannabis smoke. Poster presented at the *Tobacco-Related Disease Research Program Annual Symposium*, Oakland, CA, September 12, 2025.

Auersvald, M.; Šiman, M.; Vachková, E.; Kroufek, J.; **Barzallo, G.**; Vozka, P. A comparative study of aromatic content in pyrolysis oils from waste plastics and tires: assessing common refinery methods. *Fuel* 2024, 369, 131714. https://doi.org/10.1016/j.fuel.2024.131714.

Gentilcore, C.; Jin, K.; **Barzallo, G.**; Vozka, P.; Wang, N.-H. L. Low-pressure hydrothermal processing for conversion of polystyrene into oils. *J. Environ. Chem. Eng*. 2024, 12 (8), 113836. https://doi.org/10.1016/j.jece.2024.113836.

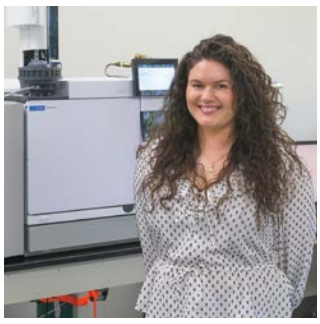
Current Research (expanded description): I am studying how pesticides and smoke-related pollutants enter people's daily lives through agriculture, wildfire events, and indoor air. My research uses silicone wristbands as wearable passive samplers that absorb volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) over time, offering an inexpensive and innovative way to capture exposures that traditional monitoring often overlooks.

In the laboratory, I develop and validate methods to detect and quantify these pollutants with high sensitivity and selectivity. Using liquid chromatography–triple quadrupole mass spectrometry (LC-QQQ), I analyze more than forty-five pesticides, optimizing ion transitions, calibration curves, and isotopically labeled internal standards to ensure accuracy. I also employ comprehensive two-dimensional gas chromatography coupled with time-of-flight mass spectrometry (GC×GC-TOFMS) to characterize the complex mixtures of chemicals found in wildfire smoke and other combustion sources. By combining targeted and non-targeted analysis, I can identify both known and unexpected contaminants that accumulate in wristbands.

This work bridges analytical chemistry and public health by transforming chemical measurements into meaningful evidence of exposure. Ultimately, my goal is to generate data that reveal hidden health risks, inform prevention strategies, and support environmental justice for communities most affected by environmental pollution.

Benefits to Science and Society: The benefits of my research extend beyond the laboratory by addressing hidden environmental exposures that disproportionately affect vulnerable and marginalized communities. By developing tools that reveal pesticide drift, wildfire smoke, and indoor pollutants, my work provides data to support environmental justice and public health protections. Equally important, I strive to communicate my findings in ways that are accessible to everyone, because science should not only advance knowledge but also empower people to protect their health.

Personal Interests: I enjoy baking sweets and sourdough, sewing my own clothes, paddleboarding, and spending as much time outdoors as possible!



ELIZABETH MORGAN BECKER

San Diego State University / University of California Davis

College of Sciences

Concentration: Ecology

Specialization: Plant Community Ecology

Donors: Elwyn Heller Foundation of San Diego / ARCS Foundation - San Diego Chapter

Elizabeth's research focuses on the successful restoration and conservation of grassland ecosystems, which are declining rapidly from global climate change and invasive species. Grasslands have a vibrant array of plant and animal life which support human health and well-being through the ecosystem services they provide, such as carbon sequestration, flood mitigation, and hunting and foraging opportunities. Elizabeth examines the mechanisms which drive diverse, climate resilient, and invasion resistant grasslands. Her research will provide actionable guidance for grassland managers globally.

Degrees: B.S. in Environmental Science, State University of New York, College of Environmental Science and Forestry.

Awards and Honors: OSGF's Plant Conservation Biology Fellowship, 2026; CNPS Student Research Grant, 2025; CNGA GRASS recipient, 2025; Nachusa Grasslands Summer Science Fellowship, 2023; JDP in Ecology Research Award, 2022.

Publications, Papers, and Posters:

Becker, E.M.; Bach, E.M.; Kleiman, B.P.; Barber, N.A. Overcoming barriers to restoration: post-restoration overseeding and topsoil disturbance improve native plant richness and diversity. *Restoration Ecology*. March 2025

Becker, E.M.; Bach, E.M.; Kleiman, B.P.; Barber, N.A. High intensity disturbances increase native species richness and diversity in a post-restoration overseeding experiment. *Ecological Society of America*. August 2024.

Kaeser, A.; Shapiro, H.; **Becker, E.M.**; Butler, D.; Wilcox, A. Sustainable intensification through community-based conservation in the Vaca Forest Reserve (VFR), Belize. *Sustainable Agricultural Intensification and Nutrition (SAIN) Conference*. Poster presentation. December 2017.

Current Research (expanded description): My research aims to address threats to grassland plant communities from the encroachment of non-native species and shifting climatic conditions. Specifically, I explore how changes in species assemblages impact ecosystem functions like nutrient cycling and productivity across pristine, restored and degraded grasslands. Additionally, because species composition can impact ecosystem function, I am investigating how diverse, climate resilient, and invasion resistant grassland communities can be built under variable environmental stressors like drought conditions. Insights from this research will provide actionable guidance for addressing challenges associated with ecosystem management and restoring or sustaining diverse grassland plant communities.

Benefits to Science and Society: Grasslands are teeming with a vibrant array of plant and animal life which provide benefits into adjacent ecosystems and communities, supporting human health and well-being. For example, grasslands provide neighboring agricultural fields with bolstered pollinator populations which improves crop yields and grassland mammals like deer provide local hunting opportunities. My research will play an integral role in the revitalization of grasslands, allowing society to garner these, and other benefits, long-term.

Personal Interests: In my free time, I enjoy spending time outdoors, drawing, traveling to new places, and reading.

ARCS Award: : I am honored to be selected for this prestigious award and greatly appreciate that my potential as a researcher has been recognized by ARCS. I am excited to join this motivated community of scholars and look forward serving the scientific community and society through impactful research as a part of ARCS. This award not only provides essential financial support for my research but also connects me with a community of scholars who will undoubtedly enhance my professional development. Engaging with this network will offer invaluable opportunities that will enrich my work.

BRITTANY MICHELLE CONLEY

San Diego State University / University of California San Diego

College of Sciences

Concentration: Biochemistry

Specialization: Molecular Mechanisms of Disease

Donor: The Reuben H. Fleet Foundation

Metabolic enzyme isocitrate dehydrogenase 1 (IDH1) helps provide cells with metabolites used in metabolic pathways. Mutations in IDH1 produce a toxic metabolite, driving tumor formation and leading to cancers such as leukemias and brain cancers. Brittany's research focuses on elucidating the mechanism of IDH1 and the role of these mutations in fatty acid metabolism. This research sheds light on how mutations in IDH1 affect both cancer progression and fat metabolism, helping to inform better targeted therapies and offers insight into the link between cancer-related proteins and fat breakdown in cells.

Degree: B.S. in Chemistry with an Emphasis in Biochemistry, California State Polytechnic University, Pomona

Awards and Honors: San Diego State University Graduate Fellowship 2024-2026; Neel Endowed Scholarship 2023; Division of Research and Innovation (DRI) and College of Graduate Studies (CGS) Doctoral Fellowship, San Diego State University 2022-2024.

Publications, Papers, and Posters:

Schwartz, A.V.; Chao, C.; Robinson, M.; **Conley, B.M**.; Adam, M.A.A.; Wells, G.A.; Hoang, A.; Albekioni, E.; Gallo, C.; Weeks, J.; Yunker, K.; Quichocho, G.; George, U.Z.; Niesman, I.; House, C.D.; Turcan, S.; Sohl, C.D. Catalytically distinct metabolic enzyme isocitrate dehydrogenase 1 mutants tune phenotype severity in tumor models. *Journal of Biological Chemistry* 2025, 301(5):108477. DOI: 10.1016/j.jbc.2025.108477 (co-first authors).

Conley, B.M.; Adam, M.A.A.; Robinson, M.; Schwartz, A.V.; Wells, G.A.; Hoang, A.; Albekioni, E.; Chao, C.; George, U.Z.; House, C.D.; Turcan, S.; Sohl, C.D. Transcriptome Analysis of R132Q IDH1 Mutations in Mouse Tumor Xenografts Demonstrate Aggressive Pro-tumor Phenotype. Poster Presentation. *Cell Bio 24 An ASCB EMBO Meeting*, San Diego, CA, December 2024.

Mealka, M.; Sierra, N.A.; Avellaneda Matteo, D.; Albekioni, E.; Khoury, R.; Mai, T.; **Conley, B.M.**; Coleman, N.J.; Sabo, K.A.; Komives, E.A.; Bobkov, A.A.; Cooksy, A.L.; Silletti, S.; Schiffer, J.M.; Huxford, T.; Sohl, C.D. Active site remodeling in tumor-relevant IDH1 mutants drives distinct kinetic features and potential resistance mechanisms. *Nature Communications* 2024, 15, 3785 (2024). DOI: 10.1038/s41467-024-48277-2.

Conley, B.M.; Nawar, A.; Marquez, I.; Uvarova, A.; Luna, L.; Hoang, A.; Sohl, C.D. Elucidating the mechanisms of human DNA polymerase epsilon (POLE) and cancer-associated mutations. Poster Presentation. *ACS* Fall 2023, San Francisco, CA, 2023.

Current Research (expanded description): Isocitrate dehydrogenase 1 (IDH1) catalyzes the reversible NADP□-dependent conversion of isocitrate (ICT) to α-ketoglutarate (αKG) in the cytoplasm and peroxisomes of cells. Mutations in IDH1 occur in cancers such as acute myeloid leukemia, gliomas, and chondrosarcomas. These mutations drive a neomorphic reaction converting αKG into the oncometabolite D-2-hydroxyglutarate (D2HG), promoting tumorigenesis. First-generation allosteric inhibitors improved patient outcomes, but resistance commonly develops within 8 months. The catalytic residues underlying mutant activity remain poorly defined, limiting development of next-generation inhibitors.

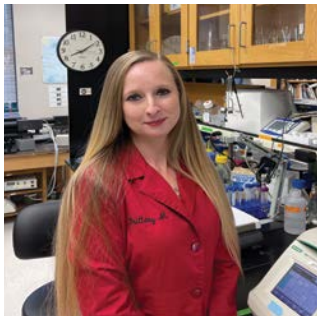
IDH1 function is also incompletely understood within its cellular context, particularly in peroxisomes. Peroxisomes regulate lipid metabolism through α-oxidation of branched-chain fatty acids and β-oxidation of very long-chain fatty acids. My research focuses on the phytanoyl-CoA pathway, where αKG, likely produced solely by peroxisomal IDH1, enables breakdown of phytanic acid into pristanic acid. Disruption leads to phytanic acid accumulation and severe disorders including Zellweger Syndrome, Neonatal Adrenoleukodystrophy, and Infantile Refsum Disease.

My work seeks to define the catalytic features enabling mutant IDH1's reduction of αKG to D2HG, test whether distinct residues mediate the conventional versus neomorphic reactions, and establish peroxisome-specific activity of wild-type and mutant IDH1. This will inform targeted drug design and IDH1's role in peroxisomal lipid homeostasis.

Benefits to Science and Society: Mutant IDH1-related cancers are often met with drug resistance, some within just a few months of treatment. My work aims to determine the key drivers of the catalytic mechanism, enabling the informed drug design of second-generation inhibitors that can combat this resistance and give patients renewed hope. Additionally, determining the link between IDH1 mutations and lipid dysregulation can help identify other areas of pathological disruptions affecting patient health.

Personal Interests: In my free time I enjoy spending time with my family, and baking, especially desserts.

ARCS Award: Being welcomed into the ARCS community is an honor and I am grateful to have been recognized with the ARCS Foundation award. I look forward to exchanging research and ideas within this community, surrounded by positive and encouraging support. As a mom of 4, graduate school is a little more challenging, especially financially. ARCS helps me focus more on my research and motivates me to accelerate my scientific achievements and give back to the scientific community.



EMILY ANNE DARIN

San Diego State University / University of California San Diego

College of Sciences

Concentration: Molecular and Marine Biology

Specialization: Genetic Engineering in Marine Systems

Donor: Danielle James

Emily's dissertation research focuses on how microbes influence animal development, specifically how microbial factors activate developmental programming through bacterial sensing. She studies this phenomenon in the marine tube worm Hydroides elegans (Hydroides), commonly found on boats and ship hauls. Hydroides larvae require a bacterial cue to reach adulthood, allowing them to settle near adults. Through this research, Emily has been able to elucidate how the immune system plays a beneficial role during development. This can be translated to human development where microbes influence overall immune health in children.

Degree: B.S in Marine Biology, California State University Fellowships.

Awards and Honors: University Graduate Fellowship Award; Reese Stealy Fellowship Award; Gordon Research Conference Symbiosis Travel Award; Trends in Marine Host-Microbe Symbiosis Travel Award.

Publications, Papers, and Posters:

Darin, E.*; Farrell, M.*; Ali, T.; Alfaro, J.; Malter, K.E.; Shikuma, N.J. MyD88 knockdown by RNAi prevents bacterial induction of tubeworm metamorphosis. *Proceedings of the National Academy of Sciences*, 2025. https://doi.org/10.1073/pnas.2505805122.

Farrell, M.; **Darin, E.;** Shikuma, N.J. Hydroides, a model tubeworm for biofouling research. *Nature Methods* 2025, https://doi.org/10.1038/s41592-025-02765-5.

Malter, K.; Dunbar, T.; Westin, C.; **Darin, E.**; Alfaro, J.; Shikuma, N.J. A bacterial membrane-disrupting protein stimulates animal metamorphosis. *mBio* 2025, 2:16, e03573-24. https://doi.org/10.1128/mbio.03573-24.

Nesbit, K.; Hargadon, A.C.; Renaudin, G.; Kraieski, N.; Buckley, K.M.; **Darin, E.**; Lee, Y.; Hamdoun, A.; and Schrankel, C. Characterization of cellular and molecular immune components of the painted white sea urchin Lytechinus pictus in response to bacterial infection. *Immunology and Cell Biology* 2025, 103, no. 1: 45- 59. https://doi.org/10.1111/imcb.12828

Current Research (expanded description): My research focuses on understanding how animals use their immune systems to respond to microbes in ways that are either beneficial or harmful. I study a marine tubeworm, Hydroides elegans, which has a remarkable life cycle: its larvae must sense specific bacteria in the ocean before they can settle and transform into adults. I am investigating how the immune pathways of this animal recognize those bacteria and how the same signaling molecules can drive very different outcomes—either promoting healthy development or activating defenses against infection. To answer these questions, I combine molecular genetics, microscopy, and genome sequencing. For example, I use RNA interference to selectively silence genes and observe how this alters larval development or immune responses. I also map where and when key immune factors are active in the animal.

The broader objective of my research is to uncover fundamental principles of how immune systems balance cooperation with microbes against protection from pathogens. This knowledge not only provides insight into how animals evolved in microbial environments but also informs human health challenges, since misregulated immune responses underlie chronic inflammatory diseases such as inflammatory bowel disease.

Benefits to Science and Society: My research will advance understanding of how animals distinguish between helpful and harmful microbes, a question central to both biology and medicine. By uncovering how immune pathways control development in marine invertebrates, my work will reveal principles that apply broadly across animals, including humans. This knowledge can guide new strategies to treat immune-related disorders, such as inflammatory bowel disease, while also deepening appreciation of marine biodiversity and its role in ecosystem health.

Personal Interests: In my free time I enjoy surfing and raising chickens

ARCS Award: The ARCS Foundation award represents both recognition and support at a pivotal stage of my training. It affirms the value of pursuing fundamental questions in biology and gives me the resources to carry out ambitious experiments with greater focus. Just as important, it connects me with a community that values science and its impact on society. This support motivates me to work harder and to mentor others with the same generosity.

MORGAN VENNESS FARRELL

San Diego State University / University of California San Diego

College of Sciences

Concentration: Cell and Molecular Biology

Specialization: Environmental Microbiology

Donor: The Reuben H. Fleet Foundation

Coral reefs are rapidly declining worldwide and require innovative solutions to stop this decline. Morgan is focusing her PhD work in studying how bacteria influence marine animal health and development with the objective of driving innovations that restore degraded coral reefs. She has uncovered a strategy that bacteria use to signal to coral and other invertebrates that they have found a suitable habitat to settle down. From this research she has developed a restoration device that helps increase marine invertebrate populations.

Degrees: M.S. in Interdisciplinary Marine and Estuarine Ecology, San Francisco State University, San Francisco; B.S in Wildlife Ecology, University of Florida, Gainesville.

Awards and Honors: Rees-Stealy Research Foundation Fellowship, 2024; University Graduate Fellowship, 2023; Outstanding Teaching Assistant Award Department of Biology, 2023; Provost's Award in Sciences for SDSU Student Symposium, 2023.

Publications, Papers, and Posters:

Farrell, M. V.; Darin, E.; Shikuma, N. J. The Biofouling Tubeworm Hydroides Elegans. *Nature Methods* 2025, 22 (8), 1607–1609. https://doi.org/10.1038/s41592-025-02765-5.

Darin, E*.; **Farrell, M. V***. ; Ali, T. N.; Rivera Alfaro, J.; Malter, K. E.; Shikuma, N. J. MyD88 Knockdown by RNAi Prevents Bacterial Stimulation of Tubeworm Metamorphosis. *Proceedings of the National Academy of Sciences* 2025, 122 (23), e2505805122. https://doi.org/10.1073/pnas.2505805122. *Co-first authors.

Farrell, M. V.; Aljaber, A. M.; Amoruso, M.; Chan, W. F.; Dael, J. R.; De Tomas, M. L.; Delavega, E. G.; Eslava, J. M.; Holdbrook-Smith, B. J.; Lee, P.; Mai, V.; Michael, L. R.; Moreno, S. V.; Quevedo, J. F.; Roberts, A. G.; Villanueva, J.; Westin, C.; Zazueta, D. M.; Shikuma, N. J. Draft Genome Sequences of Flagellimonas Sp. MMG031 and Marinobacter Sp. MMG032 Isolated from the Dinoflagellate Symbiodinium Pilosum. *Microbiology Resource Announcements* 2024, 0 (0), e00913-24. https://doi.org/10.1128/mra.00913-24.

Alker, A. T.; **Farrell, M. V.**; Aspiras, A. E.; Dunbar, T. L.; Fedoriouk, A.; Jones, J. E.; Mikhail, S. R.; Salcedo, G. Y.; Moore, B. S.; Shikuma, N. J. A Modular Plasmid Toolkit Applied in Marine Bacteria Reveals Functional Insights during Bacteria-Stimulated Metamorphosis. *mBio* 2023, 0 (0), e01502-23. https://doi.org/10.1128/mbio.01502-23.

Current Research (expanded description): A major hurdle in coral restoration practices is having coral larvae consistently undergo a transition from its larval form to a settled adult (i.e. settlement). Bacteria mediate this process and can stimulate invertebrate development. Therefore, my research centers around uncovering bacterial cues and developing applications in restoration.

Recently, I discovered that an ecologically important class of bacteria, Alphaproteobacteria, are very strong inducers of settlement. Alphaproteobacteria make up 20-40% of the bacteria in marine biofilms. The signal that Alphaproteobacteria use to induce settlement is through structures that coat their outer membrane, called lipopolysaccharides (LPS). LPS is a known structure that causes pathogenicity. However, in this context LPS is serving a beneficial role in promoting animal settlement.

I am currently studying the role of LPS and how it can act as a pathogen or beneficial molecule. I will study how LPS from diverse sources triggers an immune response in marine invertebrates. Through this research path I developed a settlement device that utilizes a coating of LPS to reliably induce settlement and increase percent settlement in a model Tubeworm. The future applications of Alphaproteobacteria as a restoration tool could provide a solution to a major bottleneck in current coral restoration practices.

Benefits to Society and Science: The process of bacteria stimulating animal settlement is important for seeding new animals and growing populations. Threatened marine invertebrates like corals, oysters, and abalone are all influenced by beneficial bacteria. Therefore, characterizing how beneficial bacteria interact with animal hosts can uncover new biomolecules that can be harnessed for restoration potential. We can translate these findings into new restoration strategies that tackle key issues such as the stability of the biomolecule and the ability to manufacture on a large-scale.

Personal Interests: Outside of my research, I enjoy being outside in nature snorkeling, hiking, camping, and practicing photography.

ARCS Award: The ARCS Foundation award provides me significant financial security and a boost in my professional confidence. I am excited and grateful to have the opportunity to join a community of scholars where I will have the chance to learn from their experiences. Discussing my research with this wider community will propel me forward in my research direction and push me to produce innovative research that has a broader impact.

I see the opportunity to become an ARCS scholar as more than just enhancing my professional development, but also as an opportunity to continue working on scientific outreach. Through the networking aspect I can find new opportunities to be involved in mentoring young scientists. I can also use the expertise of other scholars to find new resources and opportunities to encourage current students that I am currently mentoring.

GREGORY JAMES JORDAN

San Diego State University / University of California San Diego

College of Sciences

Concentration: Biology

Specialization: Cancer Biology

Donor: Hervey Family Fund

Ovarian cancer is the most lethal gynecological malignancy and the fifth deadliest cancer in women, largely because it frequently returns after chemotherapy. Greg is investigating how a communication system inside ovarian cancer cells, known as the Notch signaling pathway, enables cancer cells to resist chemotherapy and drive tumor regrowth. By elucidating the function of this pathway, Greg's research can help guide the development of drugs that block Notch signaling, with the potential to prevent ovarian cancer relapse and significantly improve long-term outcomes for patients.

Degrees: M.S. in Biology, California State University of San Marcos; B.S. in Biochemistry and Molecular Biology, University of California, Santa Barbara.

Awards and Honors: ARCS Foundation Scholarship (2025); San Diego State University Graduate Fellowship (2023); CSUSM Multicultural Intelligence and Leadership Award (2022); Phi Theta Kappa Honor Society (2015).

Publications, Papers, and Posters:

Waters, J. A.; Lucht, C.; Howe, S.; **Jordan, G. J**.; Ixchel, U.; Gilbert, S. F.; Cripps, R. M.; Robinson, M.; House, C. D. Preadipocyte-induced upregulation of IGFBP5 enhances ovarian cancer tumorigenesis via CREB signaling. *iScience* 2025, 28 (8), 113034. DOI: 10.1016/j.isci.2025.113034.

Cruz, L. S.; Robinson, M.; Stevenson, D.; Amador, I. C.; **Jordan, G. J.**; Valencia, S.; Navarrete, C.; House, C. D. Chemotherapy enriches for proinflammatory macrophage phenotypes that support cancer stem-like cells and disease progression in ovarian cancer. *Cancer Research Communications* 2024, 4 (10), 2638-2652. DOI: 10.1158/2767-9764.CRC-24-0311.

Haynes, W. A.; Kamath, K.; Bozekowski, J.; Baum-Jones, E.; Campbell, M.; Casanovas-Massana, A.; Daugherty, P. S.; Dela Cruz, C. S.; Dhal, A.; Farhadian, S. F.; Fitzgibbons, L.; Fournier, J.; Jhatro, M.; **Jordan, G. J**.;

Klein, J.; Lucas, C.; Kessler, D.; Luchsinger, L. L.; Martinez, B.; Catherine Muenker, M.; Pischel, L.; Reifert, J.; Sawyer, J. R.; Waitz, R.; Wunder, E. A.; Zhang, M.; Iwasaki, A.; Ko, A.; Shon, J. C. High-Resolution Epitope Mapping and Characterization of SARS-COV-2 Antibodies in Large Cohorts of Subjects with COVID-19. *Nature Communications Biology* 2021, 4, 1317. DOI: 10.1038/s42003-021-02835-2.

Current Research (expanded description): Ovarian cancer is the most lethal gynecologic malignancy and the fifth deadliest cancer among women, largely due to its high rate of relapse after chemotherapy. Research suggests that cancer stem-like cells (CSCs), a small subpopulation of cells within the tumor, drive this relapse due to their ability to survive chemotherapy and later regenerate the tumor. However, the mechanisms CSCs use to trigger recurrence, and the timing of their activation, remain poorly understood.

Our preliminary data indicate that a developmental communication system in cells, called the Notch signaling pathway, becomes elevated in ovarian tumors following chemotherapy. Notch regulates stem cell survival and growth and may enable CSCs to resist chemotherapy and promote tumor regrowth. To investigate this, I helped develop a novel ovarian cancer relapse model in mice that mirrors patient treatment timelines. I also engineered ovarian cancer cell lines that fluoresce when Notch is active, allowing us to track its activity in real time.

My research aims to pinpoint the critical window during relapse when CSCs rely on Notch signaling. This insight could support the repurposing of existing Notch-blocking drugs, which are often limited by toxicity, for safer, time-targeted use—offering new strategies to prevent relapse and improve survival.

Benefits to Science and Society: One of the greatest challenges in ovarian cancer is its high relapse rate after chemotherapy. Research suggests that chemotherapy-resistant cancer cells rely on a communication system called the Notch signaling pathway. By pinpointing the specific context and timing of Notch activation, this work aims to improve the effectiveness of Notch-blocking drugs and repurpose existing ones in safer, more targeted ways. This strategy could help prevent relapse, extend patient survival, and inspire new treatments for other aggressive, therapy-resistant cancers.

Personal Interests: My interests and hobbies include: spending time with my wife, surfing, hiking, playing guitar, playing tennis, and doing martial arts.

ARCS Award: The ARCS Foundation award means a great deal to me, both personally and professionally. It provides the financial security I need to focus fully on my research, without the constant strain of balancing academic responsibilities with financial concerns. This support allows me to continue building a research project aimed at improving outcomes for patients with ovarian cancer, and to pursue it with improved clarity and commitment.

This award will also financially provide me with the opportunity to attend and present at multiple conferences that are highly relevant to my work, which I would otherwise be unable to attend due to financial constraints. Sharing my findings with leaders in the field and connecting with other researchers will allow me to grow as a scientist, gain critical feedback, and expand the impact of my research.

Beyond the tangible support, being part of the ARCS community is deeply meaningful to me. It is an honor to be recognized among such a talented group of scholars, and I'm inspired by the mission of ARCS to advance science through meaningful investment in young researchers. I'm grateful for the opportunity not only to benefit from this award, but to give back by helping build the ARCS network and inspiring the next generation of scientists

DENNIS DIMITRI KRUTKIN

San Diego State University / University of California San Diego

College of Sciences

Concentration: Bioinformatics

Specialization: Computational Biology, Metagenomics

Donors: ARCS Foundation – San Diego Chapter

Dennis' research focuses on leveraging metagenomics – the practice of reading all the genetic material in a sample to discover which microbes are present and what they are doing, without growing them in the lab. Dennis applies this approach across multiple fields: understanding the human microbiome and health, guiding mouse studies for early therapeutic intervention, revealing how diet shapes the gut microbiome, and supporting ecological restoration and pollution cleanup. His work builds clear, reliable tools that turn massive data into practical decisions for medicine, agriculture, and environmental recovery.

Degrees: M.S. in Computer and Information Technology, University of Pennsylvania; M.S. in Bioinformatics and Medical Informatics, San Diego State University; B.S. cum laude in Cellular and Molecular Biology, San Diego State University.

Awards and Honors: Division of Research and Innovation/College of Graduate Studies Doctoral Fellowship, August 2023; Masters Research Scholarship, August 2021; Honors Undergraduate Thesis, May 2020; B.S. cum laude, May 2020.

Publications, Papers, and Posters:

Krutkin, D. D.; Thomas, S.; Zuffa, S.; Rajkumar, P.; Knight, R.; Dorrestein, P. C.; Kelley, S. T. To Impute or Not To Impute in Untargeted Metabolomics — That Is the Compositional Question. *J. Am. Soc. Mass Spectrom*. 2025, 36 (4), 742–759. https://doi.org/10.1021/jasms.4c00434.

Sisk-Hackworth, L.; Akhavan, S. R.; **Krutkin, D. D**.; Kelley, S. T.; Thackray, V. G. Genetic Hypogonadal (Gnrh1hpg) Mouse Model Uncovers Influence of Reproductive Axis on Maturation of the Gut Microbiome during Puberty. *bioRxiv* July 2, 2024. https://doi.org/10.1101/2024.07.01.601610.

Krutkin, D. D. Overflow Metabolism in Methanotrophic Bacteria. *ProQuest*, San Diego State, Montezuma Publishing.2023.http://libproxy.sdsu.edu/login?url=https://www.proquest.com/dissertations-theses/overflow-metabolism-methanotrophic-bacteria/docview/2778142241/se-2?accountid=13758.

Johnson, Z. J.; **Krutkin, D. D.**; Bohutskyi, P.; Kalyuzhnaya, M. G. Chapter Eight - Metals and Methylotrophy: Via Global Gene Expression Studies. In Methods in Enzymology; Cotruvo, J. A., Ed.; Rare-Earth Element Biochemistry: Methanol Dehydrogenases and Lanthanide Biology; *Academic Press*, 2021; Vol. 650, pp 185–213. https://doi.org/10.1016/bs.mie.2021.01.046.

Current Research (expanded description): Dennis' research focuses on investigating microbial communities using metagenomics – the sequencing of all genetic material in a sample to reveal which organisms are present and the genes they have available for metabolic activity. In mouse studies, he mapped how gut microbes alter molecule utilization and side effects, identifying microbial pathways that can improve preclinical intervention. In the Nachusa Prairie Grasslands Restoration, managed by The Nature Conservancy, Dennis investigates how restoration reshapes soil microbes that drive nutrient cycling and plant recovery. Along the Tijuana River, Dennis profiles microbes in water and sediments to detect pathogens, track antibiotic resistance genes, and pinpoint natural degraders of pollutants, guiding safer, more effective cleanup.

Across projects, Dennis builds interaction networks that show which microbes cooperate or compete with each other, highlighting keystone species. He integrates metagenomics with additional layers of molecular data, including mass spectrometry to measure small molecules and capture gene activity, creating predictive models that connect microbial membership with function. The objectives are rigorous, reproducible workflows and decision tools that translate complex biology into clear guidance for clinicians, ecologists, and community partners.

Benefits to Science and Society: I expect my research to deliver fast and clear answers about which microbes drive health, disease, and ecosystem change. By turning genetic sequences into trustworthy maps of which bacteria are present and how they interact with each other, I will help doctors and biopharmaceutical companies personalize patient care and elucidate how diet alters the gut microbiome. Beyond medicine, these methods guide soil restoration, track pollution cleanup, and protect biodiversity, giving communities practical tools to make informed, resilient choices.

Personal Interests: Outside research, I enjoy traveling, trying new foods, working out, hiking local trails, and spending time with friends and family.

ARCS Award: For me, this award is both practical and personal. As a first-generation immigrant and the first in my family to attend college in America, it eases the financial strain of graduate training. Just as important, ARCS connects me with a vibrant community of members, alumni, fellow scholars, and community leaders whose mentorship and networks open doors for collaboration and impact. The award affirms that leaders beyond my laboratory believe in my potential to use metagenomics for human health and environmental restoration, and it challenges me to pay that trust forward through rigorous science and service.

AMANDA NANCY LEE

San Diego State University / University of California San Diego

College of Sciences

Concentration: Computational Science

Specialization: Artificial Intelligence and Radiology

Donors: Kenneth and Marjorie Blanchard / ARCS Foundation - San Diego Chapter

Amanda's research focuses on the development of cutting-edge solutions for healthcare applications centered around the detection and treatment of chronic disease. In particular, she is interested in AI-based approaches that utilize clinical imaging and genetic data. Her graduate research has primarily involved the development of an end-to-end algorithm for CT-based diagnosis and staging of chronic obstructive pulmonary disease. In addition to this project, Amanda is developing "self-supervised" AI methods, which use unlabeled data, to expedite medical imaging tasks (e.g., pathology classification, biomarker discovery, and abnormality detection) in chest radiographs.

Degrees: B.S. in Mathematics, Emphasis in Applied Mathematics, San Diego State University.

Awards and Honors: Computational Science and Engineering Award, Society of Women Engineers, 2022 & 2023; NSF Academic Support and Scholarships for Interdisciplinary Computational Scientists, 2021-2023; Doris A. Howell Foundation-CSUPERB Research Scholar Fellowship, 2021; NIH-Funded IMSD Scholar, 2020-2021.

Publications, Papers, and Posters:

Lee, A.N.; Hsiao, A.; Hasenstab, K.A. Evaluating the Cumulative Benefit of Inspiratory CT, Expiratory CT, and Clinical Data for COPD Diagnosis and Staging through Deep Learning. *Radiol. Cardiothorac. Imaging*. 2024, 6 (6), e240005. DOI:10.1148/ryct.240005.

Lee, A.N.; Hasenstab K.A. Studying Diagnostic Value of Nonstandard CT Acquisitions in COPD Severity Staging with Deep Learning. Poster presented at the *Annual American Association for the Advancement of Science (AAAS) Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) Scholars Meeting,* Washington, D.C., September 14-16, 2023.

Schwartz, A.V.; **Lee, A.N.**; Theilmann, R.J.; George, U.Z. Spatial Heterogeneity of Excess Lung Fluid in Cystic Fibrosis: Generalized, Localized Diffuse, and Localized Presentations. *Appl. Sci*. 2022, 12, 10647. DOI: 10.3390/app122010647.

Lee, A.N.; Schwartz, A.V.; Theilmann, R.J.; George, U.Z. Characterization of Mucus in Digital Image Analysis of Cystic Fibrosis Lungs. In *Proceedings of the 2020 Summer Biomechanics, Bioengineering and Biotransport (SB3C) Conference Proceedings Book*, Virtual, June 17-20, 2020; ISBN: 978-1-7351808-1-6.

Current Research (expanded description): Chronic obstructive pulmonary disease (COPD) is a progressive lung disease and the third leading cause of death worldwide. AI models for predicting COPD typically require two CT acquisitions, one at full inhalation (i.e. inspiratory) and one at full exhalation (i.e. expiratory). However, expiratory images are not clinically standard and their acquisition increases patients' exposure to potentially harmful radiation. I therefore sought to determine the added benefit of a second acquisition for CT-based COPD prediction, hypothesizing that a single CT (inspiratory or expiratory) contains the majority of information necessary for imaging-based staging. I found that a model trained on a single CT can be used to accurately stage COPD within one stage, even when compared to models incorporating multiple CT series. Single CT-based staging can reduce patients' exposure to radiation and improve accessibility to CT-based severity assessment without sacrificing performance.

In addition, I am developing self-supervised AI methods to reduce the dimensionality of features in chest radiographs. By producing meaningful, low-dimensional feature representations of large imaging datasets, I aim to reduce computational time and burden for solving medical imaging tasks (e.g., pathology classification, imaging biomarker discovery, and abnormality detection, localization and heatmapping) with minimal reduction in accuracy.

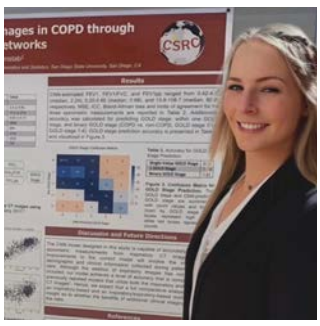
Benefits to Science and Society: My overall goal is to empower healthcare providers and researchers by building AI-assisted tools to supplement clinical workflow. My research aims to accomplish this through the development of data-driven algorithms for disease diagnosis, prognosis and staging. Although applications to lung abnormalities are emphasized, these methods are applicable to disorders throughout the body and will advance the growing fields of data-efficient learning, precision medicine, and personalized healthcare.

Personal Interests: I enjoy mentoring undergraduate students, participating in Masters rowing, running half marathons, and learning to make new espresso drinks.

ARCS Award: I am sincerely honored to receive the recognition and support of the ARCS Foundation. Being selected validates the potential impact of my research and reinforces my drive to advance science and medicine through artificial intelligence.

While several aspects of pursuing my doctorate are extremely rewarding, there are certain financial barriers that come with being a graduate student. The ARCS scholarship alleviates these barriers and allows me to focus on my research goals. Beyond the financial impact of the award, I am grateful for the opportunity to engage with the ARCS community, learn from ARCS mentors, and meet other scholars who share similar challenges and experiences.

My goal is to one day work in the biotechnology industry or at a national laboratory, where I can conduct high-impact research, interact and collaborate with academia, and mentor students of diverse backgrounds and levels. Thanks to the ARCS Foundation, I am now one step closer to that goal. The generosity of the ARCS Foundation inspires me to continue working hard toward my degree, stay involved in outreach, and continue to mentor undergraduate students. My hope is to build a career where I will be able to help students achieve their goals just as the ARCS Foundation has helped and supported me.



NANCY LEÓN-RIVERA

San Diego State University / University of California San Diego

College of Sciences

Concentration: Biomedical Sciences

Specialization: Cancer Biology

Donor: Tanya Shierling / ARCS Foundation – San Diego Chapter

Triple-negative breast cancer is one of the most aggressive forms of breast cancer, with limited treatment options and frequent relapse after chemotherapy. Nancy is researching how cancer-associated fibroblasts, which are non-cancerous cells that become activated by surrounding signals in the tumor environment, affect cancer growth and response to treatment through a process called autophagy, or cellular recycling. By uncovering how these fibroblasts create a protective environment for tumors, Nancy hopes to identify new ways to weaken that support system, improve chemotherapy effectiveness, and reduce relapse in patients.

Degree: B.A. in Biology and Chemistry, Whittier College.

Awards and Honors: Honorable Mention, Association for Women in Science Scholarship (2025); First Place Poster Presentation, Scripps Research, Symposium And Luncheon Underscoring Diversity (2024); Prebys Biomedical Research Endowed Scholarship (2023); NIH Post-Baccalaureate Research Experience Program, UCSC (2019).

Publications, Papers, and Posters:

Chin, B.; **Leon-Rivera, N**.; Monkkonen, T. Impacts of Inhibition of Endothelial Cell Autophagy on Tumorigenesis. Poster Presentation. *Mechanisms & Models of Cancer Symposium*, Salk Institute for Biological Studies, La Jolla, CA. July 2025.

Filipowska, J.; Cisneros, Z.; Varghese, S. S.; **Leon-Rivera, N.**; Wang, P.; Kang, R.; Lu, G.; Yuan, Y.-C.; Shih, H.-P.; Bhattacharya, S.; Dhawan, S.; Garcia-Ocaña, A.; Kondegowda, N. G.; Vasavada, R. C. LGR4 Is Essential for Maintaining β-Cell Homeostasis through Suppression of RANK. *Molecular Metabolism*. 2025, 92, 102097. DOI: 10.1016/j.molmet.2025.102097.

Leǿn-Rivera, N.; Keene, M.; Monkkonen. T. Exploring the Role of Autophagy in Cancer- Associated Fibroblasts: Implications for Tumor Desmoplasia and Metastasis. Poster Presentation. *Symposium And Luncheon Underscoring Diversity (SALUD) in Biological Science*, San Diego, CA, October 2024.

Kondegowda, N. G.; Filipowska, J.; Do, J.-S.; **Leon-Rivera, N.**; Li, R.; Hampton, R.; Ogyaadu, S.; Levister, C.; Penninger, J. M.; Reijonen, H.; Levy, C. J.; Vasavada, R. C. RANKL/RANK Is Required for Cytokine-Induced β-Cell Death; Osteoprotegerin, a RANKL Inhibitor, Reverses Rodent Type 1 Diabetes. *Science Advances* 2023, 9 (44), eadf5238. DOI: 10.1126/sciadv.adf5238.

Current Research (expanded description): Triple-negative breast cancer is one of the most aggressive breast cancer subtypes, with poor patient outcomes and limited treatment options. While most therapies focus on cancer cells, my research investigates the tumor microenvironment, specifically cancer-associated fibroblasts (CAFs). These non-cancerous cells become activated by signals in the tumor environment and contribute to fibrosis, extracellular matrix remodeling, cytokine secretion, and metastasis; all features that promote therapy resistance and poor survival. I hypothesize that CAF autophagy, a stress-induced cellular recycling process, sustains a tumor-supporting microenvironment in triple-negative breast cancer by driving fibroblast activation, extracellular matrix remodeling, and inflammatory signaling. To test this, I use transgenic mouse models with fibroblast-specific autophagy inhibition to 1) assess how loss of autophagy impacts extracellular matrix deposition and metastasis, 2) define how autophagy regulates cytokine secretion and whether CAF-derived cytokines promote metastasis, and 3) investigate how chemotherapy influences CAF autophagy and whether this contributes to tumor spread. By uncovering how CAF autophagy supports tumor progression, my research has the potential to identify new therapeutic targets that make triple-negative breast cancer more responsive to treatment. These findings may also apply to other cancers with dense, fibrotic microenvironments, such as pancreatic and ovarian cancers.

Benefits to Science and Society: Triple-negative breast cancer disproportionately affects women, especially those in underserved communities, and remains one of the most difficult cancers to treat. My research focuses on how cancer-associated fibroblast autophagy, a cellular recycling process, promotes fibrosis, cytokine secretion, and metastasis. Understanding these mechanisms could reveal new ways to weaken the tumor's stroma and enhance chemotherapy response. This work may also identify biomarkers to guide treatment decisions and has potential relevance for other cancers with fibrotic microenvironments, including pancreatic and ovarian cancers.

Personal Interests: I enjoy spending time with family and friends, relaxing at home, and playing board games together.

ARCS Award: The ARCS Foundation award provides meaningful support that allows me to focus fully on my development as a scientist. This award eases financial pressures, giving me the flexibility to concentrate on my research in aggressive breast cancers and on publishing my first-author manuscript. With support from ARCS, I am also able to share my findings at conferences, where I can strengthen collaborations and translate discoveries into strategies that benefit patients. Equally important, this award affirms my commitment to mentorship and equity in STEM. I have built my academic journey on the belief that science progresses when diverse perspectives are included. Support from ARCS empowers me to continue mentoring undergraduate and graduate students, expanding opportunities for STUDENTS historically underrepresented in science. Ultimately, this award brings me closer to my long-term goal of becoming a professor leading a cancer biology lab. The encouragement and recognition of ARCS motivates me to persevere through the challenges of biomedical research, knowing that my work has the potential to positively impact both science and society.

CHRISTINA RODAMA VEZIRIS

San Diego State University / University of California San Diego

College of Sciences

Concentration: Clinical Psychology

Specialization: Neuropsychology, Fetal Alcohol Spectrum Disorders

Donor: Laura Mateo

Prenatal alcohol exposure and childhood adversity act as adverse factors that disrupt typical neurodevelopment. These prenatal and postnatal adverse experiences affect brain functioning and behavior, resulting in symptoms that are related to increased risk of trouble with the law. Christina's research aims to understand the underlying neurodevelopmental processes affected by the dual impact of prenatal alcohol exposure and childhood adversity and how this impact can increase the likelihood of trouble with the law. Christina also aims to develop better diagnostic measures that will lead to earlier identification of prenatal alcohol exposure.

Degrees: M.S. in Clinical Psychology, San Diego State University; B.A. in Psychology, University of San Francisco.

Awards and Honors: Research Society on Alcohol (RSA) Student Merit Award (2023, 2024), NIAAA T32 Alcohol Research Training Grant (2022, 2023, 2024).

Publications, Papers, and Posters:

Veziris, C. R.; Kable, J. A.; Wozniak, J. R.; Coles, C. D.; May, P.A.; Kalberg, W. O.; Sowell, E. R.; Riley, E. P.; Mattson, S. N.; CIFASD. Is the ND-PAE diagnosis specific to prenatal alcohol exposure?. Presented at the *Annual Meeting of the Research Society on Alcohol*, New Orleans, LA, June 2025.

Veziris, C. R.; Kable, J. A.; Wozniak, J. R.; Coles, C. D.; May, P.A.; Kalberg, W. O.; Sowell, E. R.; Riley, E. P.; Mattson, S. N.; CIFASD. Adaptive functioning criteria in ND-PAE diagnosis are specific to prenatal alcohol exposure in children with ADHD. Presented at the *9th International Research Conference on Fetal Alcohol Spectrum Disorders*, Seattle, WA, March 2025.

Veziris, C. R.; Hyland, M. T.; Kable, J. A.; Wozniak, J. R.; Coles, C. D.; May, P.A.; Kalberg, W. O.; Sowell, E. R.; Riley, E. P.; Mattson, S. N. Validation of the ND-PAE diagnosis in children with heavy prenatal alcohol exposure. *Child Psychiatry Hum Dev*. 2024. DOI: 10.1007/s10578-024-01740-z.

Veziris, C. R.; Kable, J. A.; Wozniak, J. R.; Coles, C. D.; May, P.A.; Kalberg, W. O.; Sowell, E. R.; Riley, E. P.; Mattson, S. N.; CIFASD. The Effect of ADHD Symptoms on the ND-PAE Diagnosis in Children with Heavy Prenatal Alcohol Exposure. Poster Presentation. *Annual Meeting of the Research Society on Alcohol*, Minneapolis, MN. June 2024.

Current Research (expanded description): Though the effects of prenatal alcohol exposure have been widely studied, it is estimated that 80% of individuals with prenatal alcohol exposure in foster care are not diagnosed. Therefore, the first aim of my research is to increase the diagnostic abilities of clinicians who work with this population by assessing the validity of diagnostic criteria and diagnostic measures to better capture prenatal alcohol exposure.

The second focus of my research is to study the connection of prenatal alcohol exposure and childhood adversity to neurodevelopmental outcomes, specifically in cognition and behavior, and to involvement in the justice system. Prenatal alcohol exposure increases one's likelihood of experiencing adversity in childhood, and their combined effect is understudied. As prenatal alcohol exposure and childhood adversity have similar effects on cognitive and behavioral functioning, the effect of these two types of adversity when combined can lead to even more significant difficulties. In addition, these cognitive and behavioral challenges may increase the risk of involvement with the law. Understanding this connection can give us clarity on areas to intervene as well as implement public policies that take into account the symptoms experienced by individuals with prenatal alcohol exposure and childhood adversity.

Benefits to Society and Science: With better diagnostic measures, children who have been exposed to alcohol prenatally will receive earlier and more specified care for their symptoms, improving their quality of life. My research will not only help individuals with prenatal alcohol exposure and their families better understand the mechanisms behind their behaviors but also provide support for future interventions and prevention of further childhood adversity. My research will also provide support for public policy that considers prenatal alcohol exposure in the justice system.

Personal Interests: I enjoy reading, playing games, taking walks, and spending time with family and friends.

ARCS Award: I am incredibly honored to be selected as a scholar by the ARCS Foundation and am extremely grateful for the support that this award provides me to study this significant developmental concern. This support will allow me to go above and beyond my research project, allowing me the time and financial support to connect with scientists in multiple disciplines and disseminate my research to the community. The receipt of this award will enable me to become a successful scientific researcher, and I am tremendously grateful for this opportunity.

Scripps Research

STEPHAN MIGUEL FREEMAN

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Chemistry

Specialization: Organic Chemistry

Donors: Drs. Mara and Larry Ybarrondo / ARCS Foundation - San Diego Chapter

Extracts of the bark of the Galbulimima tree are used in the traditional medicine of Papua New Guinea to relieve pain and induce hallucination, and these effects are attributable to forty small-molecule natural products found in the bark. Stephan is working to access these natural products by chemical synthesis – evidence suggests that Galbulimima alkaloids target central nervous system receptors, but identification of receptor targets has been limited by the low quantities of individual alkaloids in the bark (approx. 10 ppm). Reliable synthetic access to Galbulimima alkaloids will help to discover these molecules' mechanism of action, and might produce a collection of new CNS-active small molecules.

Degree: B.S. in Chemistry, Xavier University.

Awards and Honors: Xavier University Student Researcher of the Year, 2021; Borcer Fund Research Fellowship, 2019.

Publications, Papers, and Posters:

Freeman, S.M.; Landwehr, E.M.; Rojas, J.J.; Tanaka, R.; Bailey, J.B.; Gembicky, M.; Shenvi, R. A. Decagram-scale synthesis of GB13, a Galbulimima alkaloid precursor. *Chemrxiv* 2025, doi:10.26434/chemrxiv-2025-490r9.

Shevick, S.L.; **Freeman, S.M.**; Tong, G.; Russo, R.J.; Bohn, L.M.; Shenvi, R. A. Asymmetric Syntheses of (+)- and (-)-Collybolide Enable Reevaluation of kappa-Opioid Receptor Agonism. *ACS Central Science.* 2022, 8, 7, 948-954.

Shevick, S.L.; **Freeman, S.M.**; Tong, G.; Russo, R.J.; Bohn, L.M.; Shenvi, R. A. Asymmetric Syntheses of (+)- and (-)-Collybolide Enable Reevaluation of kappa-Opioid Receptor Agonism. Presented at *National Organic Symposium*, San Diego, CA, June 2022.

Current Research (expanded description): In vivo assays of Galbulimima alkaloids between 1950 and 1970 identified numerous alkaloids possessing a CNS-active phenotype in mammals. However, given the extremely low (<0.5%) abundance of alkaloids in Galbulimima bark, only the most prevalent alkaloid, himbacine, could be assigned a receptor target: 4 nM antagonism of the muscarinic acetylcholine receptor M2. Other Galbulimima alkaloids induce diverse effects in vivo, but further investigation of their properties and identification of their receptor targets have been significantly impeded by a scarce natural supply of Galbulimima alkaloids. Synthetic access to these alkaloids would greatly enable a rigorous biochemical investigation. My goal is to accomplish a synthesis of the "class II" alkaloids that comprise over half of all Galbulimima alkaloids isolated to date. These class II alkaloids bear additional oxidations relative to other family members that frustrates attempts to synthesize them by direct analogy to prior work.

Benefits to Science and Society: Himbacine, the most abundant Galbulimima alkaloid, was subject to a medicinal chemistry campaign by Schering-Plough that culminated in the discovery of an FDA approved PAR-1 antagonist, vorapaxar. We believe that even more Galbulimima alkaloids have untapped medicinal potential; our syntheses may yield numerous starting points for medicinal chemistry through the discovery of new CNS-active scaffolds.

Personal Interests: I love the piano! When I'm not at the lab, I'm working on Ravel's *Gaspard de la nuit* – one of my favorite pieces ever written.

ARCS Award: I learned much of what I know about chemistry from my mentor in my first year of graduate school – and former ARCS scholar – Sophie Shevick. It's a true honor for me to be included alongside her and the other incredible scientists of ARCS. I'm grateful for the opportunity to learn from this community of scientists, and for the support that will help me advance my study of chemistry.

DIEGO DANIEL GOMEZ-CEBALLOS

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Molecular and Cellular Biology

Specialization: Renal Cancer Biology

Donor: Paul and Cleo Schimmel / ARCS Foundation – San Diego Chapter

Diego studies how our body's internal clock (circadian rhythms) affects kidney function and disease development. He focuses on how the kidney responds to changes in oxygen availability through the hypoxia response, a pathway that has been shown to be under circadian regulation. Specifically, he investigates how certain proteins called transcription factors, which act like master keys that unlock specific parts of our DNA to control these biological pathways. Diego's research looks at how these factors influence the progression of Clear Cell Renal Cell Carcinoma, the most common type of kidney cancer, and how these interactions vary between healthy and diseased kidney states.

Degree: B.S. in biochemistry, California State University San Marcos.

Awards and Honors: NSF GRFP Honorable mention, 2025., U2C/TL1 NIDDK fellowship, 2024., SOARE Fellow at The University of Maryland, College Park 2022.

Publications, Papers, and Posters:

Mello, R.M., **Gomez Ceballos, D.**, Sandate, C.R. BMAL1 and ARNT enable circadian HIF2α responses in clear cell renal cell carcinoma. *Nat Commun* 2025, 16, 5834 DOI: https://doi.org/10.1038/s41467-025-60904-0.

Valentina Vozella; Vittoria Borgonetti; Bryan Cruz; Celsey M. St. Onge; Ryan Bullard; Roman Vlkolinsky; **Diego Gomez Ceballos**; Angela R. Ozburn; Amanda J. Roberts; Roberto Ciccocioppo. Aprimilast reduces co-occuring alcohol drinking and mechanical allodynia and regulates central amygdala GABAergic transmission. *JCL Insights* 2025, 10(8), e189732. DOI: https://doi.org/10.1172/jci.insight.189732.

Current Research (expanded description): Within every mammalian cell resides a biological clock that acts as the conductor for the daily molecular symphony of gene expression. Biological clocks influence gene expression across all mammalian tissues, but nowhere is this more relevant than in the kidney. With ~14% of its genes controlled in a circadian fashion, the kidney is the second most rhythmic and metabolically active organ in the body, exhibiting oscillations in waste filtration and oxygen availability throughout the day.

Changes in oxygen tension are controlled at the molecular level by the hypoxia response, a pathway responsible for cellular metabolic reprogramming in low oxygen environments and the production of vasculature and blood cells. Recent studies have found that disruption of these rhythms can lead to acute kidney injury and cancer.

Perplexingly, we have discovered that Clear Cell Renal Cell Carcinoma (ccRCC) cells maintain robust circadian rhythms and that BMAL1, the master transcription factor controlling the biological clock, can interact with regulators of the hypoxia response (HIF1/2α). My research as an ARCS Scholar focuses on discovering novel interactors of HIF2α in ccRCC cells using a proximity labeling approach. We will deconvolute HIF2α's proteome, identify and screen potential interactors, and ultimately provide a platform for studying transcription factor proteomes, a notoriously challenging field.

Benefits to Science and Society: Clear Cell Renal Cell Carcinoma (ccRCC) is the 7th most common cancer in the developed world, accounting for ~70% of all RCC cases worldwide, yet remains poorly characterized molecularly. My research aims to uncover novel mechanisms driving this malignancy and identify new therapeutic targets unique to ccRCC with fewer side effects than current treatments. This will enhance our understanding of circadian rhythms in health and disease, from optimal drug timing to how biological clocks influence disease progression, profoundly impacting patient outcomes.

Personal Interests: I love to do boxing/kickboxing, hiking, work on cars, play water polo, see a good play, and read historical books.

ARCS Award: Being selected to receive an ARCS Foundation award is a massive honor for me as a scientist. To me, it represents recognition of the passion and effort I have put into my academic career and validation of my potential as a future scientific leader. Before I became set on becoming a scientist, I was an avid water polo player who represented the Mexican national team at high levels. While I succeeded in the pool, I struggled academically, and there was no shortage of teachers who made me feel incapable of becoming a competent scholar.

Ultimately, I decided to abandon my career in water polo for one in science because I fell in love with the discipline as I studied it more, and I felt I had the potential to make meaningful contributions to this field. The transition wasn't easy, but it taught me that passion and dedication can overcome early setbacks.

An ARCS Foundation award means more than financial security to me, it means that my scientific future is worthy of investment. ARCS's mission to advance science in America by supporting outstanding students resonates deeply with my own journey from struggling student to passionate researcher. This award validates that I chose the right path and reinforces my commitment to contributing to scientific discovery that can benefit society.

ANTHONY HAROUT GURUNIAN

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Biophysics

Specialization: Biomolecular Condensate Biophysics

Donor: The Reuben H. Fleet Foundation

Biomolecular condensates are liquid droplets in the cell which are composed of proteins, salt, and water. Anthony is investigating how these droplets can come into contact with cell membranes and induce a localized voltage, kind of like a tiny battery. This can have significant implications for neuroscience where membrane voltages are responsible for the electrical communication between brain cells. By connecting the fields of condensate biophysics and neuroscience through his research, Anthony hopes to open the door for novel therapeutic approaches in the future.

Degree: B.S. University of Rochester.

Awards and Honors: 2024-2025 Honorable Mention, NSF Graduate Research Fellowship. 2024-2026 Ian A. Wilson Endowed Fellowship for Structural Biology, The Skaggs Graduate School of Chemical and Biological Sciences. 2021 BME Faculty Award for Excellence in Undergraduate Research, University of Rochester.

Publications, Papers, and Posters:

Gurunian, A.; Lasker, K.; Deniz, A.A. Biomolecular Condensates can Induce Local Membrane Potentials. *bioRxiv* 2024. DOI: 10.1101/2024.12.27.630407.

Baliga, U. K.; **Gurunian, A.**; Nogales, A.; Martinez-Sobrido, L.; Dean, D. A. Electroporation-and Liposome-Mediated Co-Transfection of Single and Multiple Plasmids. *Pharmaceutics* 2025, 17 (7), 905. DOI: 10.3390/pharmaceutics17070905.

Gurunian, A.; Dean, D. A. Multiple Conductance States of Lipid Pores during Voltage-Clamp Electroporation. *Bioelectrochemistry* 2023, 151, 108396. DOI: 10.1016/j.bioelechem.

Gurunian, A.; Dean, D. A. Modeling and Simulation of Current-Clamp Electroporation. *Bioelectrochemistry* 2022, 147, 108162. DOI: 10.1016/j.bioelechem.2022.108162.

Current Research (expanded description): Biomolecular condensates are liquid droplets in the cell which are often composed of proteins, RNA, salt, and water. They are also known as "membraneless organelles" due to their ability to sequester biomolecules without the use of a lipid membrane. However, condensates can also interact with membranes in many biologically relevant contexts. Since condensates also often carry a net charge, I hypothesized that condensates can induce localized membrane potentials when they come into contact with cellular membranes. Using an electrochromic dye, I was able to demonstrate condensate induced local membrane potentials in vitro using Giant Unilamellar Vesicles as a model membrane system. I am now working to demonstrate the biological relevance of my hypothesis by testing the consequences of the condensate induced electrochemical gradient on the activity of membrane proteins such as ion channels. Since condensates can also selectively partition certain ions, they may also influence the selectivity of ion channels. Thus, I have introduced an important, new type of biophysical regulation for ion channels and other membrane proteins which could have significant implications in neuroscience. My goal is to connect the fields of condensate biophysics and cellular electrophysiology, and make new, unexpected discoveries as a result.

Benefits to Science and Society: In the course of my research, I may uncover important principles that in the future could guide mechanistic understanding of ion channel pathophysiologies. This will have potential down-the-road impacts on science and society by providing novel drug targets to researchers in the pharmaceutical industry which could subsequently result in new avenues for treating diseases associated with ion channels. My research will have a large impact on the scientific community by connecting the fields of neuroscience, condensate biology, and membrane biology.

Personal Interests: I am a classically-trained pianist, and enjoy playing tennis and chess.

ARCS Award: I am honored to receive the ARCS foundation award. It is a powerful endorsement of my work and gives me extra encouragement and motivation to pursue my scientific goals. In addition, it allows me to focus on my research with less financial stress.

CATHERINE YICONG LI

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Biomedical Sciences

Specialization: Virology

Donor: Toby Eisenberg

The genetic information of human immunodeficiency virus 1 (HIV-1) is encoded in RNA that folds into complex and dynamic 3D structures. Catherine is studying a structured region of the HIV-1 genome essential for viral packaging, which is when new copies of the virus are assembled in the host cell before being released as infectious mature viruses. She is determining the viral packaging capabilities of thousands of RNA mutants to build a quantitative model of HIV-1 RNA function in cells, which will elucidate a novel target for antiviral drug development.

Degrees: B.A. in Biology, University of Pennsylvania.

Awards and Honors: : Scripps Research Supporting Growth for Women in Science Fund Travel Award, 2025; Poster Presentation Prize at 30th Annual Meeting of the RNA Society, 2025; ARCS Scholar, 2023-present; Scripps Research Kellogg Fellow, 2023-present.

Publications, Papers, and Posters:

Li, C. Y.; Sandhu, S.; Hollmann, N. M.; Summers, M. F.; Ken, M. L. Investigating the Structure-Function Relationship of HIV-1 5′ Leader RNA with Mutational Probing. Poster presented at the *30th Annual Meeting of the RNA Society*, San Diego, CA, May 28, 2025.

Li, C. Y.; Sandhu, S.; Ken, M. L. RNA ensembles from in vitro to in vivo: Toward predictive models of RNA cellular function. *Curr. Opin. Struct. Biol*. 2024, 89, 102915. DOI: 10.1016/j.sbi.2024.102915.

Sen, P.; Donahue, G.; **Li, C.**; Egervari, G.; Yang, N.; Lan, Y.; Robertson, N.; Shah, P. P.; Kerkhoven, E.; Schultz, D. C.; Adams, P. D.; Berger, S. L. Spurious Intragenic Transcription Is a Feature of Mammalian Cellular Senescence and Tissue Aging. *Nat. Aging*. 2023, 3 (4), 402−417. DOI: 10.1038/s43587-023-00384-3.

Sen, P.; Lan, Y.; **Li, C. Y.;** Sidoli, S.; Donahue, G.; Dou, Z.; Frederick, B.; Chen, Q.; Luense, L. J.; Garcia, B.

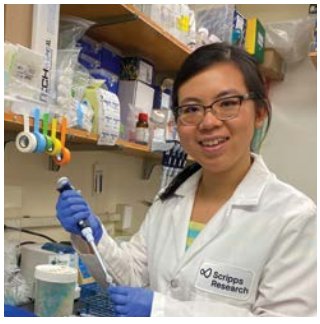
A.; Dang, W.; Johnson, F. B.; Adams, P. D.; Schultz, D. C.; Berger, S. L. Histone Acetyltransferase p300 Induces De Novo Super-Enhancers to Drive Cellular Senescence. *Mol. Cell*. 2019, 73 (4), 684−698. DOI: 10.1016/j.molcel.2019.01.021.

Current Research (expanded description): The RNA genome of human immunodeficiency virus 1 (HIV-1) contains a region called the 5′ leader that has extensive secondary and tertiary structure. The 5′ leader can fold into two conformational states that alter its function, with one state favoring viral packaging. To determine structural features critical for viral packaging, I am constructing a 5′ leader library consisting of families of mutations designed to systematically alter key aspects of RNA dynamics (ex. helix stability, junction geometry and kinetics, planarity, tertiary interactions). I will measure the functional output of each mutant in a high-throughput manner by adapting a viral packaging assay that I developed and validated. After transfecting this library into a mammalian cell line, I will use next-generation sequencing techniques to analyze the RNA extracted from viral particles, which will identify mutants that are defective in viral packaging. This information about the 5′ leader's structural dynamics will be utilized to build a quantitative model of its cellular function. Such a model could be used to predict the viral packaging potential of any given HIV-1 genome sequence, which could be applied to evaluating emerging viral strains, understanding clinical outcomes from natural variants, and identifying targets for antiviral drug development.

Benefits to Society and Science: AIDS is a global public health challenge with no cure, and although current HIV treatments have dramatically improved the life expectancy of AIDS patients, new and improved drugs are needed to address the inaccessibility of daily pill regiments for many around the world and the emergence of drug resistance in HIV strains. My research aims to uncover structural features of the HIV RNA genome that are critical for viral replication and can be a target for future novel antiviral drugs.

Personal Interests: In my free time, I enjoy reading fiction, taking long walks, watching theater, and traveling.

ARCS Award: I am extremely honored to be recognized by the ARCS Foundation and join the illustrious cohort of current and past ARCS scholars. The generous support from this award allows me to focus on pursuing ambitious research and dedicate time to my ongoing mentorship and outreach efforts. I am excited to learn from the ARCS community, united in our passion for benefiting society through scientific advancements and uplifting the next generation of scientists.



PIERRE PHILLIP LOCH-TEMZELIDES

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Chemistry

Specialization: Synthetic Organic Chemistry - Total Synthesis

Donor: The Reuben H. Fleet Foundation

Cembranoid natural products from the coral Sinularia flexibilis have long been studied for their unique structures and biological activities. Among them, sinularin (also known as flexibilide) has been investigated for its anti-cancer, anti-inflammatory, and anti-bacterial activities. Pierre's research focuses on the total synthesis of sinularin. This undertaking helps to further understand the bioactivity of this natural product and potentially create medicinally relevant analogs. It also provides insight into the preparation of all-carbon macrocycles common to the cembranoid motif, a known challenge in synthetic organic chemistry.

Degree: B.S. in Chemistry, Rice University.

Awards and Honors: Awarded NIH Pre-doctoral Training T32GM159580 (Fall 2025); Awarded Carlos F. Barbas III Endowed Memorial Fellowship (Fall 2024); Awarded Rice University's Distinction in Research and Creative Work (Spring 2024); Awarded Rice University President's Honor Roll (2023).

Publications, Papers, and Posters:

Rodriguez, A. M.; **Loch-Temzelides, P.**; Pandiri, S.; Kirkland, J. K.; Davenport, M. T.; Aguinagua, U.; Yousufuddin, M.; Ess, D. H.; Kürti, L. Forging structural complexity: diastereoselective synthesis of densely substituted β-lactams with dual functional handles for enhanced core modifications. *Chemical Science* 2024, 15, 14668-14676. DOI: 10.1039/D4SC01513D.

Current Research (expanded description): Sinularin has recently been implicated for its induction of autophagy-dependent cell death by activating ULK1 and enhancing FOXO3-ATG4A axis in prostate cancer cells. This compound has been known for decades, with studies demonstrating biological activity across a variety of regimes in the initial isolation disclosures and some follow-up studies. However, the compound is isolated from soft coral, which is central to aquatic ecosystems, and, to date, an asymmetric total synthesis of sinularin has not yet been reported. My research focuses on a modular approach to the total synthesis of sinularin which would allow not just for access to the natural product, but to many analogs of potential medicinal relevance. This approach relies on modern methodologies in synthetic organic chemistry to construct the core scaffold of sinularin, and, due to its modularity, the approach may be amenable to the synthesis of other cembranoid natural products of differing patterns of oxidation. This work explores a novel approach to the total synthesis of the all-carbon macrocyclic framework of cembranoids, a historically challenging synthetic problem.

Benefits to Society and Science: Total synthesis allows for the application of the methodology of organic chemistry to complex target in the form of a natural product. This process not only provides access to the natural product for further biological studies but ideally also allows for the preparation of analogs. Beyond the preparation of the natural product, total synthesis helps to determine the scope and limitations of current synthetic methodology, as well as to highlight areas for potential invention in pursuit of the target.

Personal Interests: Outside of the lab I am interested in computers (hardware and software), amateur electronics, music, and cooking!

ARCS Award: Philanthropic support of scientific research breaks down barriers to research topics that may otherwise be overlooked and, ultimately, allows for the expansion of the frontiers of science. Receiving this award is a tremendous honor, and it helps support my research at a deeply uncertain time for funding in science, allowing me to focus entirely on my work without financial worry. I am deeply grateful to the ARCS foundation for this award and for their continued support of science!

KARENNA MINYUN NG

Scripps Research

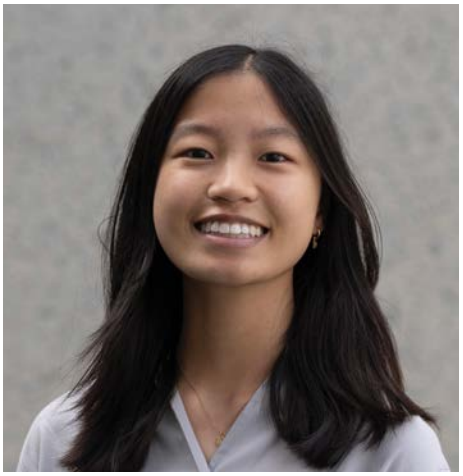
Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Immunology

Specialization: Machine Learning

Donors: Karen and Robert Bowden

Karenna's research focuses on developing antibody language models, which are machine learning tools trained on millions of antibody sequences. Antibodies are crucial for immune defense and widely used in medicine because of their ability to bind targets with high specificity. However, improving their effectiveness using traditional methods is tedious. By leveraging powerful computational resources to analyze large sequence datasets, she aims to train models that learn structural patterns, identify beneficial mutations, and support the efficient design of novel antibodies with enhanced binding and stability.



Degree: B.S. in Biology and Math, Northeastern University.

Awards and Honors: : Endowed Fellowship in the Skaggs Graduate School of Chemical and Biological Sciences, 2023-2026; NSF Graduate Research Fellowship Program Honorable Mention, 2025; Scripps Network for Women in Science (NWiS) Travel Award for Excellence in Science, 2024.

Publications, Papers, and Posters:

Neyestanak, M. S.; Burbach, S. M.; **Ng, K.**; Gangavarapu, P.; Hurtado, J.; Magura, J.; Ismail, N.; Muema, D.; Ndung'u, T.; Ward, A. B.; Briney, B. Data-Optimal Scaling of Paired Antibody Language Models. *bioRxiv* September 6, 2025, p 2025.09.02.673765. https://doi.org/10.1101/2025.09.02.673765.

Ng, K.; Briney, B. Focused Learning by Antibody Language Models Using Preferential Masking of Non-Templated Regions. *PATTER* 2025, 0 (0). https://doi.org/10.1016/j.patter.2025.101239.

Ng, K.; Briney, B. Focused Learning by Antibody Language Models Using Preferential Masking of Non-Templated Regions. Poster presented at the Adaptive Immune Receptor Repertoire (AIRR) *Community Meeting VII*, Porto, PT, June 6, 2024.

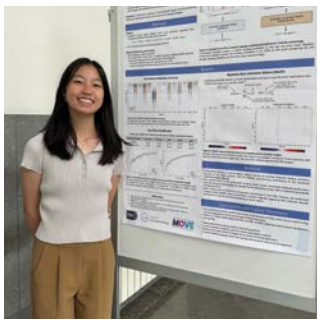
Current Research (expanded description): Antibodies are proteins that the immune system uses to bind and neutralize foreign molecules. Their binding ability improves through somatic hypermutation (SHM) and selection during affinity maturation, yet engineering antibodies in the laboratory often requires slow searches through vast sequence spaces. My research develops transformer-based antibody language models to learn the underlying properties of human antibodies and use them to guide rational design.

First, to address limited data, I designed an immunologically informed training objective that focuses learning toward the most diverse and functional regions, particularly the Complementarity Determining Region 3 (CDR3). This encourages models to capture patterns that extend beyond germline templates. Second, I am building a framework that emulates SHM to predict mutations that improve binding while maintaining properties of natural antibodies, such as proper folding and low potential for autoreactivity; promising candidates will be tested experimentally. Third, I apply explainable AI techniques to relate model features to immunological principles, verify that outcomes are meaningful, reveal potential biases, and generate new hypotheses. Together, these tools aim to accelerate antibody discovery, deepen understanding of immune evolution, and support the efficient development of safer, more effective vaccines and therapies.

Benefits to Society and Science: As AI systems become increasingly integrated into research and healthcare, expanding their interpretability is essential. Understanding how models reason can build trust, uncover hidden biases, and support their responsible use in critical domains. My work focuses on building transparent and reliable antibody language models. These tools have the potential to streamline therapeutic development by identifying promising candidates early, which reduces experimental burden and ultimately advances both scientific discovery and health outcomes.

Personal Interests: I like to dance, travel, and try new ice cream and coffee shops with friends!

ARCS Award: It is a tremendous honor to be recognized as an ARCS Scholar, and I'm excited to join the community of exceptional scientists supported by the ARCS Foundation. This recognition affirms my research efforts so far and encourages me to continue making meaningful contributions to my field and society. The award is not only a vital financial support but also signifies strong belief in my potential as an independent scientist. I am deeply grateful for this opportunity and look forward to sharing my work with the ARCS community.



ARIANA (ARI) SULPIZIO

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Biomedical Sciences

Specialization: Biomedical Biology

Donor: ARCS Foundation - San Diego Chapter

Ariana studies small molecules that affect the cGAS-STING pathway, a crucial component of our immune system. When a cell experiences stress from cancer or infection, DNA can mistakenly accumulate in the wrong areas. The cGAS-STING pathway detects this misplaced DNA and signals the immune system to respond. In her research, Ariana has characterized a new inhibitor that could help treat autoimmune disorders caused by the overactivation of this pathway. She has also investigated different classes of pathway activators, revealing important insights that could lead to anti-cancer therapies targeting the cGAS-STING pathway.

Degrees: B.S in Chemistry, Haverford College.

Awards and Honors: 2025 *NSPIRE Fellow, CIRM EDUC4 Training Program, 2022; Haverford College Chemistry Departmental Honors, 2021.

Publications, Papers, and Posters:

Gharpure, A.; **Sulpizio, A.**; Loeffler, J.R.; Fernández-Quintero, M.L.; Tran, A.S.; Lairson, L.L.; Ward, A.B. Distinct oligomeric assemblies of STING induced by non-nucleotide agonists. *Nature Communications* 2025, 16, 3440. DOI: 10.1038/s41467-025-58641-5.

Chin, E. N.; **Sulpizio, A.**; Lairson, L. L. Targeting STING to promote antitumor immunity. *Trends in Cell Biology* 2023, 33, 2742-2753. DOI: 10.1016/j.tcb.2022.06.010.

Cho, Y. I.; Armstrong, C. L.; **Sulpizio, A.**; Acheampong, K. K.; Banks, K. N.; Bardhan, O.; Churchill, S. J.; Connolly-Sporing, A. E.; Crawford, C. E. W.; Cruz Parrilla, P. L.; Curtis, S. M.; De La Ossa, L. M.; Epstein, S. C.; Farrehi, C. J.; Hamrick, G. S.; Hillegas, W. J.; Kang, A.; Laxton, O. C.; Ling, J.; Matsumura, S. M.; Merino, V. M.; Mukhtar, S. H.; Shah, N. J.; Londergan, C. H.; Daly, C. A.; Kokona, B.; Charkoudian, L. K. Engineered Chimeras Unveil Swappable Modular Features of Fatty Acid and Polyketide Synthase Acyl Carrier Proteins. *Biochemistry* 2022, 61 (4), 217–227. DOI: 10.1021/acs.biochem.1c00798.

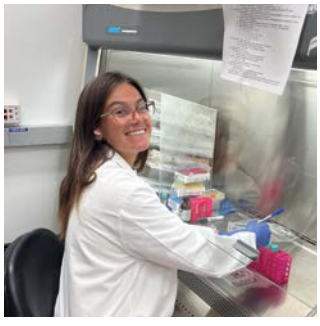
Sulpizio, A.; Crawford, C. E. W.; Koweek, R. S.; Charkoudian, L. K. Probing the Structure and Function of Acyl Carrier Proteins to Unlock the Strategic Redesign of Type II Polyketide Biosynthetic Pathways. *J. Biol. Chem.* 2021, 296, 100328. DOI: 10.1016/j.jbc.2021.100328.

Current Research (expanded description): The cyclic GMP-AMP synthase-stimulator of interferon genes (cGAS-STING) pathway is a crucial component in the immune system linking innate and adaptive immunity. Overactivation of this pathway contributes to the pathogenesis of a variety of autoinflammatory diseases, such as Aicardi-Goutières syndrome and systemic lupus erythematosus, while its activation can enhance CD8+ T cell-mediated anti-tumor responses. For these reasons, pharmacological manipulation of the pathway is a promising therapeutic strategy for a variety of disease states. Previously in the Lairson Lab, a high throughput screen was conducted to identify both inhibitors and activators of the pathway. I have determined the biological target of an identified cGAS-STING inhibitor, revealing a previously unknown component of the pathway. As I continue to investigate the mechanism of action, I aim to characterize this novel inhibitor and identify additional druggable components of the pathway. I am also investigating ligand-dependent differences in STING activation and downstream pathway signaling. By elucidating the structural mechanisms underlying STING activation, my work could contribute to the development of optimized STING-targeting anti-cancer therapies. Overall, this research aims to advance our understanding of the cGAS-STING pathway and aid in the development of innovative treatments for a range of diseases.

Benefits to Society and Science: Despite its more recent discovery, the cGAS-STING pathway has been rapidly implicated in a variety of diseases such as cancer, Parkinson's disease, Aicardi-Goutières syndrome, and systemic lupus erythematosus. However, many functional aspects remain poorly understood. My research aims to elucidate underlying molecular mechanisms and identify novel components of this pathway, thereby enabling us to fully harness the potential of cGAS-STING modulators for the treatment of a multitude of diseases.

Personal Interests: Outside of lab, I enjoy running, playing field hockey, singing in local choirs, and teaching piano lessons.

ARCS Award: I am truly honored to receive the ARCS Foundation award. It feels incredible to pursue a career that I am passionate about while making strides to improve human health. Awards like this empower me to continue my work! I also look forward to engaging with the broader San Diego community and sharing my research. I am extremely grateful for this support and excited to use it as motivation to continue growing as a scientist.



MADISON FAY WAGNER

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Chemistry

Specialization: Organometallics/Catalysis

Donor: Dorothy Georgens

Madison specializes in organometallic catalysis, which utilizes transition metals to enact chemical reactions. Her main area of interest is transient directing group (TDG) chemistry, a strategy that uses simple amino acids to control selectivity of products and allows for precise tuning of chemical compounds. Madison's main project involves the TDG controlled difunctionalization of alkynes to yield tetraphenylethylene derivatives. These compounds have applications in materials science, bacteria imaging, molecular motors, and cancer cell diagnostics. Her work has expanded the utility of TDG-enabled chemistry and allowed for detailed study of tetraphenylethylene derivatives.

Degree: B.S. in Chemistry, California State University San Marcos.

Awards and Honors: 2024 NSF GRFP Honorable Mention; 2023 Hertz Fellowship Finalist; 2022 Kellogg Fellow; 2022 CSUSM College of STEM Outstanding Graduate.

Publications, Papers, and Posters:

Gao, Y.; **Wagner, M. F.**; Mendoza, S. D.; Engle, K. M. Carboboration and Carbosilylation. *Comprehensive Organic Synthesis, III*, 2025, DOI: 10.1016/B978-0-323-96025-0.00101-0.

Wagner, M.; Remec, L.; Engle, K. Transient-directing-group enabled alkyne difunctionalization to yield tetra-arylated alkenes. Orally presented at the *American Chemical Society National Meeting*, San Diego, CA, March 24, 2025. https://doi.org/10.1021/scimeetings.5c11021.

Wagner, M.; Iafe, R. Microwave-assisted, gold-catalyzed intramolecular etherification of diols to afford benzylic cyclized ethers. Poster presented at the *American Chemical Society National Meeting*, San Diego, CA, March 2022.

Wagner, M.; Iafe, R. Microwave-assisted, gold-catalyzed intramolecular etherification of diols to afford benzylic cyclized ethers. Orally presented at the *Southern California Conferences for Undergraduate Research*, November 20, 2021.

Current Research (expanded description): Fully differentiated tetra-aryl alkenes are traditionally difficult to access as single isomers, with most existing methods yielding a mixture of isomers that are then difficult to separate. Alkyne difunctionalization represents an effective and powerful method to access these scaffolds through the controlled addition of a nucleophile and electrophile across the carbon–carbon triple bond. Previous reports on alkyne difunctionalization towards these targets molecules, however, have exhibited poor regiocontrol, resulting in isomeric mixtures, or have been limited to a narrow scope of aryl groups. The development of a transient-directing-group (TDG) strategy provides unprecedented levels of regiocontrol in alkyne difunctionalization, allowing the synthesis of products containing four unique aryl groups as single isomers. Mechanistically, the reaction involves reversible condensation of an amino acid co-catalyst with a native aldehyde functional group. Regioselectivity is controlled by formation of a palladacycle between the TDG-substrate and the metal catalyst, which undergoes selectivity-determining migratory insertion. TDG-enabled alkyne difunctionalization has the potential to quickly and efficiently yield a vast library of tetraphenylethylene derivatives with high selectivity. With a rapid and facile method for accessing these compounds, properties of interest, such as aggregation-induced emission, can be further explored for a variety of applications

Benefits to Science and Society: Transient directing group (TDG) chemistry is an emerging yet powerful method of controlling selectivity in reactions, allowing for the synthesis of highly specific products. Coupled with transition metal catalysis, these methods are quicker, more ecologically friendly, and lower cost than traditional strategies, making TDG chemistry attractive to pharmaceutical and material development. This research also allows for synthesizing a library of tetraphenylethylene derivatives, which previously lacked facile, rapid methods of diversification, allowing the unique properties of these compounds to be explored.

Personal Interests: I served as Miss Rodeo California 2019 and am heavily involved in the equestrian industry and the western lifestyle.

ARCS Award: The ARCS Foundation award is an incredible privilege that I am honored to receive. This award ensures increased financial stability, which allows me to focus solely on my research. Beyond financial support, being awarded this honor makes me feel more confident about my identity as a scientist and empowers me to continue my work in chemistry, outreach, and community building. I am incredibly grateful to be an ARCS scholar.

DRASON HAN ZHANG

Scripps Research

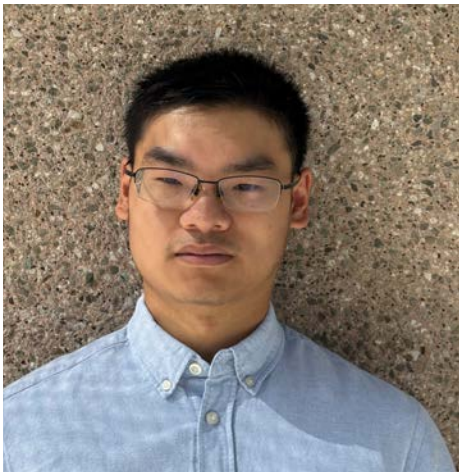
Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Chemistry

Specialization: Organic Chemistry

Donor: ARCS Foundation - San Diego Chapter

There is a need for next-generation opioids that reduce risk of addiction and abuse while maintaining therapeutic efficacy. To do so, it is important to understand the biological processes impacted by opioid receptor signaling. However, such studies are complicated by the variety of different effects that these compounds may induce. Drason is synthesizing novel opioid compounds to examine their efficacy, localization in brain tissue, and downstream biological pathways. He hopes that in doing so, he can help improve the ability to design analgesics with zero or minimal addictive potential.



Degree: B.S. in Chemistry, Emory University.

Awards and Honors: ACS Organic Chemistry Award, 2023; Phi Beta Kappa, 2023.

Publications, Papers, and Posters:

Smith, G.; **Zhang, D.H.**; Zhang, W.; Soliven, A.; Wuest, W. Visible-Light/Nickel-Catalyzed Carboxylation of C(sp2) Bromides via Formate Activation. *J. Org. Chem*., 2023, 88 (13), 9565-9568.

Pearson, K.; Doherty, C.; **Zhang, D.H**.; Becker, N.A.; Maher, L.J. Optimized quantitative PCR analysis of random DNA aptamer libraries. *Anal. Biochem.*, 2022. 650, 114712.

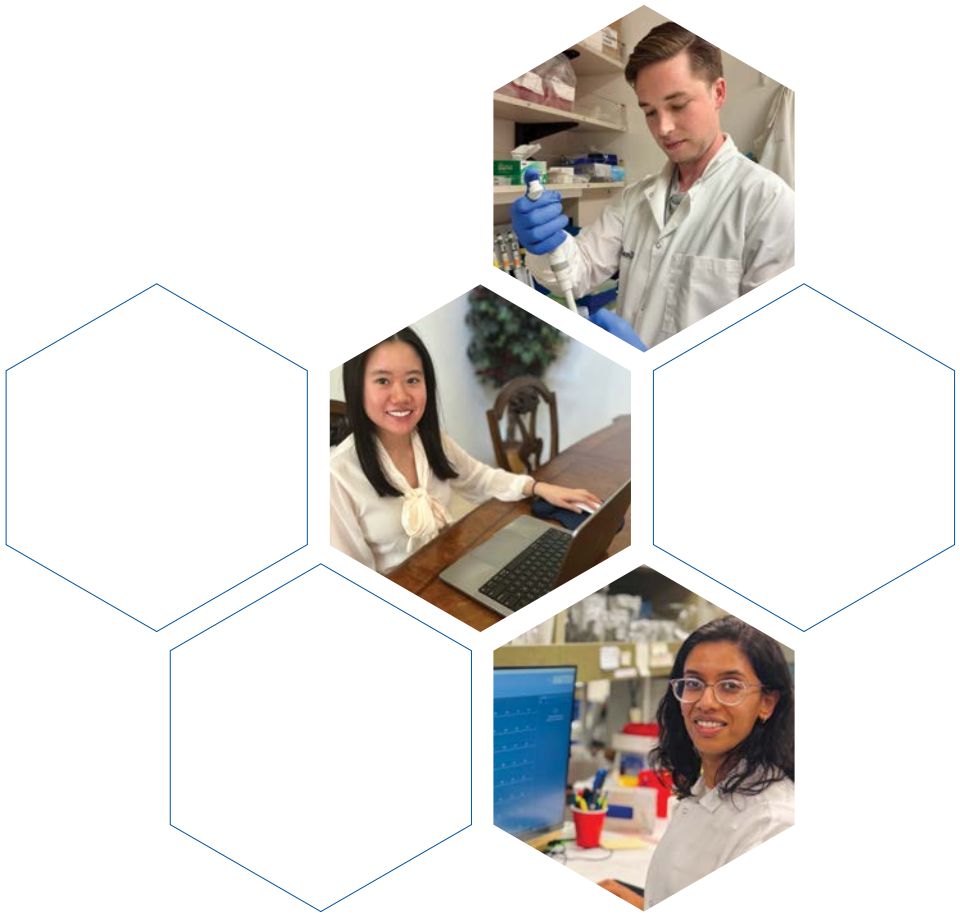
Current Research (expanded description): The opioid receptor system is highly complex, with different receptors combining with numerous possible ligands. Much effort has been made to understand how ligand affinity for specific receptors affects the pharmacological activity of natural and synthetic opioids. However, while in vitro studies can reveal affinity and selectivity for target receptors, it remains difficult to directly correlate these results to behavioral or physiological outcomes. This may relate to the heterogenous nature of the brain; different brain regions show distinct patterns of expression for opioid receptors and thus can lead to vastly different downstream events. Our lab has collaborated with neuroscience research groups to study localization of opioid ligands in the brain to correlate this information with phenotypic effect—we have synthesized analogs of different natural and synthetic opioids for this purpose. However, for some compounds, synthesis throughput is gated by unstable intermediates or unscalable chemical transformations. My goal is to devise and execute a scalable and efficient synthesize of a new analog series that removes structural motifs responsible for instability. Completion of this goal will enable the synthesis of novel tool compounds which can be used to study localization in the brain and be evaluated for therapeutic potential.

Benefits to Science and Society: If true that localization in the brain plays a role in determining the opioid receptor response to a binding compound, then this research would provide a potential way to study and tune compounds to localize to desired brain regions. In doing so, we may be able to eliminate undesired effects elicited by opioids, such as addiction and central nervous system depression, improving and de-risking pain medication.

Personal Interests: When not in the lab, I enjoy chess.

ARCS Award: I am labmates with current ARCS scholar Stephan, who has been an incredible role model as a chemist. It is an honor for me to be selected as an ARCS scholar alongside him, and I hope to demonstrate the same depth of knowledge and creativity. Funding from the ARCS foundation will provide support for my growth, and I am very grateful for the support and opportunity to learn from this community of scientists.


UC San Diego



RIMJHIM AGARWAL

University of California San Diego

School of Medicine

Concentration: Biomedical Sciences

Specialization: Immunology

Donor: The Paul Bechtner Foundation / ARCS Foundation – San Diego Chapter

Chikungunya virus is a mosquito-borne virus that causes fever and joint pain. Due to climate change, outbreaks are now appearing in new areas like France, Italy, and southern China. While many people recover quickly, about 30% of infected individuals, primarily women, develop chronic joint pain similar to arthritis, which can last for years. My research focuses on understanding how the immune system responds to chikungunya virus in chronic cases. This knowledge could help us develop better treatments to reduce long-term arthritis symptoms and improve quality of life for those affected.

Degree: B.A. in Molecular and Cell Biology, UC Berkeley.

Awards and Honors: American Association of Immunologists (AAI) Abstract Award, Hawaii; Major Symposium Speaker, American Association of Immunologists Conference 2024; The Tullie and Rickey Families SPARK Fellowship, La Jolla Institute for Immunology; Poster Award, La Jolla Immunology Conference 2023.

Publications, Papers, and Posters:

Agarwal, R.; Ha, C.; Côrtes, F. H.; Lee, Y.; Martínez-Pérez, A.; Gálvez, R. I.; Castillo, I. N.; Phillips, E. J.; Mallal, S. A.; Balmaseda, A.; Harris, E.; Romero-Vivas, C. M.; Premkumar, L.; Falconar, A. K.; Grifoni, A.; Sette, A.; Weiskopf, D. Identification of Immunogenic and Cross-Reactive Chikungunya Virus Epitopes for CD4+ T Cells in Chronic Chikungunya Disease. *Nat Commun.* 2025, 16 (1), 5756. https://doi.org/10.1038/s41467-025-60862-7.

Agarwal, R.; Chang, J.; Côrtes, F. H.; Ha, C.; Villalpando, J.; Castillo, I. N.; Gálvez, R. I.; Grifoni, A.; Sette, A.; Romero-Vivas, C. M.; Heise, M. T.; Premkumar, L.; Falconar, A. K.; Weiskopf, D. Chikungunya Virus-Specific CD4+ T Cells Are Associated with Chronic Chikungunya Viral Arthritic Disease in Humans. *Cell Reports Medicine* 2025, 6 (5), 102134. https://doi.org/10.1016/j.xcrm.2025.102134.

Agarwal, R. (May 2024). "Chikungunya-virus-specific CD4+ T cells are associated with chronic chikungunya viral arthritic disease in humans" [Oral presentation] Immune Responses to Chronic Infections, Major Symposium Trainee Speaker, *American Association of Immunologists (AAI) Conference*, Chicago, IL.

Tsu, B. V.; **Agarwal, R.**; Gokhale, N. S.; Kulsuptrakul, J.; Ryan, A. P.; Fay, E. J.; Castro, L. K.; Beierschmitt, C.; Yap, C.; Turcotte, E. A.; Delgado-Rodriguez, S. E.; Vance, R. E.; Hyde, J. L.; Savan, R.; Mitchell, P. S.; Daugherty, M. D. Host-Specific Sensing of Coronaviruses and Picornaviruses by the CARD8 Inflammasome. *PLOS Biology* 2023, 21 (6), e3002144. https://doi.org/10.1371/journal.pbio.3002144.

Current Research (expanded description): Chikungunya virus (CHIKV) is a prototypic mosquito-borne arthritogenic alphavirus that has led to numerous epidemics around the globe and is classified as a neglected tropical virus. It typically presents as acute febrile illness but can progress into chronic chikungunya virus disease in almost 30-60% of infected individuals. Chronic disease is characterized by persistent debilitating arthritis-like symptoms that can significantly impair one's quality of life. Despite its global burden, the mechanisms driving chronic disease remain poorly defined and the efficacy of treatment remains highly variable between individuals.

T cells can play a crucial role in controlling viral infections but can also contribute to immunopathology. My work demonstrates that individuals with chronic arthritis six years post-CHIKV infection have significantly higher frequencies of CHIKV-specific CD4+ T cells in the periphery as opposed to those who had recovered post-infection, suggesting a potential pathogenic role of CD4+ T cells in chronic disease. These unexpected observations warrant a deeper investigation into the precise phenotype and function of CHIKV- and other alphavirus-specific T cells. The overall goal of my work is to comprehensively characterize immune responses to CHIKV in order to elucidate mechanisms underlying chronic post-viral symptoms and to inform the development of targeted immunomodulatory therapeutics.

Benefits to Science and Society: As mosquito populations expand due to warming climate, the risk of infection from viruses like chikungunya is rising. My research investigates how the immune system, particularly T cells, contributes to chronic disease following chikungunya virus infection. By identifying pathogenic immune responses, my work will support the development of targeted therapies and vaccines. More broadly, it will improve our understanding of how viruses drive long-term diseases, offering insights relevant to other chronic, virus-associated conditions.

Personal Interests: In my free time, I enjoy reading, exploring San Diego with friends and traveling.

ARCS Award: I am incredibly grateful to the ARCS foundation for recognizing my work and appreciate their support for young scientists like me. This award will provide me with financial security to pursue my research and allow travel to scientific conferences to share my work with other scientists in the field. I am excited to join the community of ARCS scholars and learn from other scientists.

HANNAH ROSE BATTEY

University of California San Diego / San Diego State University

Herbert Wertheim School of Public Health and Human Longevity Science

Concentration: Public Health

Specialization: Epidemiology

Donor: Lambert Foundation for Education

Hannah is investigating the most common bacterial pathogens responsible for community-acquired pneumonia. Her research focuses on identifying which bacterial peptides are recognized by the immune system during infection. Currently, pneumonia treatments often begin without confirming the bacterial cause, leading to potential disease mismanagement, prolonged illness, and negative outcomes. Hannah aims to discover bacterial T cell epitopes that could be used in developing rapid diagnostic assays or vaccines, improving both treatment precision and patient outcomes.

Degrees: M.S. in Human Biology, University of Copenhagen; B.S. in Biological Sciences, University of California, Santa Barbara.

Awards and Honors: Merkin Graduate Fellowship (2025); San Diego State University Graduate Fellowship (2023).

Publications, Papers and Posters:

Battey, H.; Doran, B.; Flood, A.; Nussbaum, J.; Seto, T.; Srisatidnarakul, S.; Tegtmeier, B.; Dadwal, S. The COVID-19 Infection Control Response at a Large Stand-Alone Comprehensive Cancer Center in Los Angeles County. *Cancer Rep*. 2022, 5 (3), e1669. https://doi.org/10.1002/cnr2.1669.

Malhotra, G. K.; Tran, T.; Stewart, C.; **Battey, H.**; Tegtmeier, B.; McNeese, K.; Flood, A.; Melstrom, L.; Fong, Y. Pandemic Operating Room Supply Shortage and Surgical Site Infection: Considerations as We Emerge from the Coronavirus Disease 2019 Pandemic. *Journal of the American College of Surgeons*, 234(4). 2022. https://doi.org/10.1097/XCS.0000000000000087

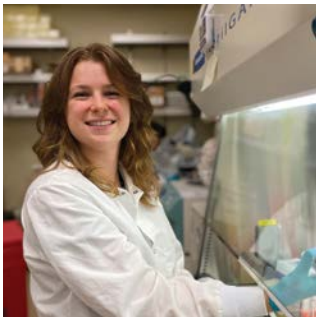
Woodworth, J. S.; Clemmensen, H. S.; **Battey, H.**; Dijkman, K.; Lindenstrøm, T.; Laureano, R. S.; Taplitz, R.; Morgan, J.; Aagaard, C.; Rosenkrands, I.; Lindestam Arlehamn, C. S.; Andersen, P.; Mortensen, R. A Mycobacterium Tuberculosis-Specific Subunit Vaccine That Provides Synergistic Immunity upon Co-Administration with Bacillus Calmette-Guérin. *Nat. Commun*. 2021, 12 (1), 6658. https://doi.org/10.1038/s41467-021-26934-0.

Current Research (expanded description): Hannah will use predictive models to identify bacterial peptides most likely to be recognized by the human immune system based on specific characteristics. The top peptides will be synthesized and tested for immunogenicity using blood samples from human donors. Detailed analysis of peptide recognition across different disease states will reveal bacterial components associated with infection. Epitopes unique to acute infection could serve as the basis for a diagnostic tool, requiring only a small blood sample. Furthermore, the discovery of epitopes across multiple bacterial pathogens will significantly expand our understanding of potential vaccine targets.

Benefits to Science and Society: The most common bacteria that cause pneumonia are severely understudied, despite being a common disease that is often deadly, particularly for the elderly and immunocompromised. This research will massively expand our understanding of how our immune systems recognize these pathogens. All of the epitopes that are discovered will be shared publicly on the Immune Epitope Database & Tools (IEDB) website to broaden research for these bacteria and hopefully inspire the next generation of diagnostics and vaccines.

Personal Interests: I enjoy long solo hikes whilst listening to audiobooks, backpacking with my twin brother, traveling with friends and enjoying new restaurants in San Diego.

ARCS Award: This award is incredibly meaningful to me. My hard work and sacrifices feel validated and I feel energized and ready to get to work and make a difference with my research. This financial assistance is a huge relief to me. Your support is felt and appreciated. Thank you so much!



DANIEL MILGRAM BEAGLEHOLE

University of California San Diego

Jacobs School of Engineering

Concentration: Computer Science and Engineering

Specialization: Machine Learning

Donor: Beyster Family Foundation

One of the biggest mysteries in the study of deep learning is why neural networks are able to perform well at test time (i.e., on data that was not used for learning). Daniel's work demonstrates that neural networks achieve this remarkable test performance by learning a particular statistic that is specific to the given dataset (a phenomenon known as feature learning). Daniel has shown how this mechanism can explain a variety of "intelligent" behaviors in deep learning, including the emergence of edge detectors in networks used for vision tasks. Further, Daniel demonstrated that the mechanism of feature learning identified in his work can be implemented in a simple, fast, and interpretable method that gives state-of-the-art performance on tabular data.

Degrees: M.S. Computer Science, Columbia University; B.S. Mathematics, University of Chicago.

Publications, Papers, and Posters:

Beaglehole, D.; Radhakrishnan A.; Pandit, P.; Belkin, M. Mechanism of Feature Learning in Convolutional Neural Networks. 2023. *arXiv* preprint. arXiv:2309.00570.

Radhakrishnan A.; **Beaglehole, D**.; Pandit, P.; Belkin, M. Mechanism of Feature Learning in Deep Neural Networks and Kernel Machines that Recursively Learn Features. *arXiv* preprint. 2022, arXiv:2212.13881.

Beaglehole, D.; Belkin, M; Pandit, P. On the Inconsistency of Kernel Ridgeless Regression in Fixed Dimensions. *SIAM Journal on the Mathematics of Data Science,* 2023.

Beaglehole, D.; Hopkins, M.; Kane, D.; Liu, S.; Lovett, S. Sampling Equilibria: Fast No-Regret Learning in Structured Games. In *Proceedings of the 2023 Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)* pp. 3817-3855. Society for Industrial and Applied Mathematics.

Current Research (expanded description): In our research, we have identified that neural networks recover a specific statistic of the input data distribution, known as the average gradient outer product (AGOP), in the uncentered covariance of their weight matrices (at every layer of the network). In fully-connected networks, the AGOP effectively re-weights input dimensions so as to emphasize coordinates that are relevant for the prediction task and de-emphasize less useful coordinates. This improves performance by reducing the dimensionality of the input without removing relevant information. We show that the AGOP explains a number of phenomena in deep learning including learning multi-index models, spurious correlations, and the simplicity bias. We also demonstrate that this method can be implemented outside of a neural network in a kernel method we call RFM, which achieves state-of-the-art performance on tabular data.

In convolutional neural networks (CNNs), we demonstrate that a similar mechanism holds - the covariances of the filters in CNNs learn the AGOP additionally averaged over patches in input images. We demonstrate that the AGOP on patches recovers edge detectors in state-of-the-art vision models such as AlexNet, VGG, and ResNets. Further, the eigenvectors of the AGOP of a kernel machine resemble Gabor filters of different orientations, a connection previously made for AlexNet.

We also verified the same mechanism holds for large language models and recurrent neural networks, though these results are unpublished. In these networks, we observe that the AGOP captures grouping of words of the same theme.

Benefits to Science and Society: Deep neural networks are the backbone of the most prominent and, perhaps, the most consequential AI applications in society. In particular, all large language models (e.g. ChatGPT) and most, if not all, vision models (e.g. as used in self-driving cars) are neural networks of some type. Despite their ubiquity in practice, and the implications of their usage, we lack a precise explanation for their performance, even in the simplest cases. It is very likely that if we can derive such an explanation that we can simplify these models significantly, improve their robustness and safety, and improve their performance.

Personal Interests: Research is my passion, but I am also an avid Brazilian Jiu Jitsu practitioner. I also enjoy playing guitar, learning to surf, and reading philosophy.

ARCS Award: I am extremely honored and grateful to have received the ARCS Foundation award. This award will support my goal to clarify the most important and puzzling questions surrounding the performance of vision models and large language models.

MORGAN M. CAUDLE

University of California San Diego / San Diego State University

School of Medicine / College of Sciences

Concentration: Clinical Psychology

Specialization: Experimental Psychopathology

Donors: Carlos and Sharon Arbelaez

Anxiety, mood, and traumatic stress disorders are highly prevalent and associated with impaired physical health and cognitive functioning. Despite the existence of evidence-based treatments, many individuals do not fully recover; therefore, there is a need for the development of novel treatments. Under the mentorship of Dr. Jessica Bomyea, Morgan is assisting with testing the effects of a novel computerized cognitive training program aimed at improving symptoms by improving cognitive functioning. Additionally, she is investigating the effects of this cognitive training program on neural functioning and related symptom change.

Degrees: B.A. in Psychology, San Diego State University

Awards and Honors: 2024: NIH T32 Predoctoral Training Program on Advanced Data Analytics for Behavioral and Social Sciences (TADA-BSSR); 60% of tuition and stipend per year; 2022: San Diego State University Graduate Fellowship Award: 2-year fellowship; $30,000 per year.

Publications, Posters, and Papers:

Caudle, M. M.; Dugas, N. N.; Patel, K.; Moore, R., C.; Thomas, M., L.; Bomyea, J. Repetitive Negative Thinking Uniquely Predicts Suicidal Ideation, Controlling for Current Psychopathology. *Psychiatry Research*. 2024, 334. DOI: 10.1016/j.psychres.2024.115787.

Caudle M. M.; Hunt, C.; Stout, D. M.; Ball, T.; Dugas, N. N.; Bomyea, J. Resting state functional connectivity differences following working memory training with massed exposure in individuals with public speaking anxiety. *Journal of Affective Disorders Repo*rts. 2024, 16. DOI: 10.1016/j.jadr.2024.100719.

Caudle M. M.; Dugas, N.; Stout, D.; Ball, T.; Bomyea, J. Adjunctive cognitive training with exposure enhances fear and neural outcomes in social anxiety. *Psychiatry Research.* 2023, 327. DOI: 10.1016/j.psychres.2023.115416.

Caudle M. M.; Spadoni, A. D.; Schiehser, D. M.; Simmons, A. N.; Bomyea, J. Neural activity and network analysis for understanding reasoning using the matrix reasoning task. *Cognitive Processing.* 2023, 24, 585-594. DOI: 10.1007/s10339-023-01152-2.

Current Research (expanded description): Repetitive negative thinking (RNT) is a common symptom of internalizing disorders and is associated with worse symptoms and increased suicidal ideation. RNT is thought to result from difficulty utilizing working memory interference control to remove irrelevant or unhelpful information from working memory capacity, resulting in individuals feeling "stuck spinning their wheels" in RNT. The relationship between RNT and WM has primarily been examined in cross-sectional laboratory settings; yet, cognition varies over time and setting, and its influence on the trajectory of RNT in daily life remains unexplored. To address this gap; I am currently preparing to submit an NRSA F31 grant proposal; I am proposing a research project aimed at elucidating the nuanced temporal relationships between repetitive negative thinking (RNT) and working memory (WM) in individuals with internalizing disorders. To achieve this aim, participants will complete a working memory task while undergoing fMRI and then ecological momentary assessments (EMA) 3x/day for 2 weeks; EMA will assess RNT, affect, and context via self-report questionnaires and WM via cognitive tasks. Through this project I intend to gain additional quantitative skills, such as training in intensive longitudinal data analysis and machine learning models to analyze both the fMRI and EMA data in conjunction.

Benefits to Science and Society: I aim to understand the dynamic relationships between working memory and repetitive negative thinking to identify treatment targets that will inform future interventions, and particularly, just-in-time interventions (JITAI). JITAIs aim to deploy adaptive mobile interventions. I hypothesize that a decline in working memory performance will precede an increase in repetitive negative thinking in daily life. Then, in future work, I am interested in investigating if this decline in working memory serves as a marker for the deployment of JITAI.

Personal Interests: In my free time I enjoy traveling to new places and snowboarding.

ARCS Award: I am honored to be selected as an ARCS Scholar. I am grateful for the acknowledgment of my work as a researcher, and I am excited to have the opportunity to meet fellow ARCS scholars and mentors and grow from my interactions with them. This award provides reassurance and further motivates my career goal of becoming a principal investigator conducting research full-time. I appreciate the doors this award opens for me and the financial support that allows me to focus more of my efforts on my research.

KAYLA M. ERLER

University of California San Diego

Jacobs School of Engineering

Concentration: Structural Engineering

Specialization: Seismic Protective Systems

Donor: The Reuben H. Fleet Foundation

Kayla specializes in research on the use of seismic isolation devices to protect buildings and bridges from damaging earthquakes. These devices have proven highly effective in reducing the forces transferred to structures and minimizing the need for repairs and downtime after seismic events. Her thesis focuses on the performance of these devices in bridges under extreme earthquake conditions, aiming to improve the understanding and reliability of design practices and ensure California's bridges—often critical lifelines—are adequately protected.

Degrees: M.S. in Structural Engineering, University of California, San Diego; B.S. in Structural Engineering, University of California, San Diego.

Awards and Honors: UCSD SE department Diversity Initiative Fellow, 2022, 2023; Alfred P. Sloan Research Fellow, 2021; Cota Robles Fellow, 2021; Provost Academic Excellence Award 2021.

Publications. Papers, and Posters

Erler, K. and Mosqueda, G.; Leveraging Machine Learning Algorithms for Regression Analysis in Shake Table Data Processing. in *18th World Conference on Earthquake Engineering 2024*, Milan, Italy, available at https://www.designsafe-ci.org/user-guide/usecases/seismicusecases/#shake-table-data-analysis-using-ml.

Bustamante, R.; **Erler, K.**; Sepulveda, C. et al. Evaluation of Seismic Isolation Retrofit Following Early Design Standards. in *18th World Conference on Earthquake Engineering 2024*, Milan, Italy.

Kwon, T.H.; **Erler, K.**; Bustamante, R.; and Mosqueda, G. Seismic Protection of Electric Cabinets in Nuclear Power Plants. in *18th World Conference on Earthquake Engineering,* Milan, Italy.

Bustamante, R., **Erler, K.**, Sepulveda, C., Mosqueda, G., Del Carpio, M., Hershberg, M., Lopez, J. and Elwood, J. K. Evaluation of Seismically Isolated Structures Designed to Early Standards. in *13th HSTAM International Congress on Mechanics 2022,* Patras, Greece.

Current Research (expanded description): Kayla's research significantly impacts science and engineering in several key areas. Her development of accessible machine learning code for data interaction and the use of high-performance computing on the DesignSafe cyberinfrastructure is a collaborative effort among researchers to promote greater code and data sharing within structural engineering—an essential step for advancing industry practices. Additionally, her work on seismic isolation in bridges provides insights that could enhance the reliability of this critical protective system, safeguarding bridges against extreme seismic events.

Personal Interests: I spend as much of my free time as possible out with my beloved horse, whom I raised from birth.

ARCS Award: Receiving the Achievement Award for College Students is an incredible honor and a significant personal milestone. I've always been driven by a deep love for structures and the desire to fully understand how they function. This recognition feels like validation that my passion and hard work are truly making an impact.

The journey hasn't been without its challenges. Overcoming financial barriers and navigating a field largely dominated by men has required resilience and perseverance. While the industry is not necessarily biased, being one of the few women can sometimes feel isolating. This award is more than just a symbol of academic success—it's a confidence boost that reassures me I am on the right path, excelling in my field while staying focused on what I truly love.

More importantly, this achievement fuels my passion for structural resilience. I'm deeply committed to ensuring that the structures we design have longer lifespans, higher reliability, and ultimately contribute to a more sustainable future. This recognition reminds me that the goals I set out for myself are not only within reach but are already becoming reality.

DANE FORD-ROSHON

University of California San Diego

School of Medicine

Concentration: Biomedical Sciences

Specialization: Neurobiology

Donor: Elizabeth and Joseph Taft

In health, the blood-brain barrier restricts blood and blood components from accessing brain tissue. However, in some neurological diseases, the blood-brain barrier can become dysfunctional, allowing blood proteins to access the brain. Dane studies how these blood proteins activate harmful inflammatory responses within microglia, the immune cells of the brain. By uncovering new ways to control how microglia respond to blood proteins, Dane hopes to identify new strategies to treat conditions such as multiple sclerosis, stroke, and Alzheimer's disease.

Degree: : B.A. in Neuroscience, Skidmore College, 2020

Awards and Honors: UCSD Biomedical Sciences David Goeddel Fellowship, 2022; National Science Foundation Graduate Research Fellowship, 2022; Skidmore College President's Award, 2020.

Publications, Papers, and Posters:

Ford-Roshon, D.; Dudek, M.; Glynn, A.; Glasman, A.; York, J.; Lawrence, E.; Nguyen, D.; Shinn, L.; Berry, G.; Kendall, L.; Bonner, J.; Ferro, A.; & Lagalwar, S. Spinocerebellar Ataxia Type 1 (SCA1) Cell Models Display Widespread Mitochondrial and Extra-Nuclear Alterations. *Journal of Molecular Neuroscience* 2025; 75(4), 131. https://doi.org/10.1007/s12031-025-02425-5.

Ford-Roshon, D.; Mendiola, A. S. Un-BAFFling gray matter pathology in multiple sclerosis. *Science Immunology* 2024; 9 (94):eadp4667. DOI:10.1126/sciimmunol.adp4667.

Kim, M.; Ly, S. H.; Xie, Y.; Duronio, G. N.; **Ford-Roshon, D**.; Hwang, J. H.; Sulahian, R.; Rennhack, J. P.; So, J., Gjoerup, O.; Talamas, J. A.; Grandclaudon, M.; Long, H. W.; Doench, J. G.; Sethi, N. S.; Giannakis, M.; & Hahn, W. YAP1 and PRDM14 converge to promote cell survival and tumorigenesis. *Developmental Cell* 2022, 57 (2), 212–227.e8. DOI: 10.1016/j.devcel.2021.12.006.

Fang, L.*; **Ford-Roshon, D**.*; Russo, M.; O'Brien, C.; Xiong, X.; Gurjao, C.; Grandclaudon, M.; Raghavan, S.; Corsello, S. M., Carr, S. A.; Udeshi, N. D.; Berstler, J.; Sicinska, E., Ng, K.; Giannakis, M. RNF43_G659fs is an oncogenic colorectal cancer mutation and sensitizes tumor cells to PI3K/mTOR inhibition. *Nature Communications* 2022, 13 (1), 3181. DOI: 10.1038/s41467-022-30794-7.

* These authors contributed to the work equally

Current Research (expanded description): In health, blood and blood components are restricted from accessing the parenchyma of the brain. However, in some neurological diseases, including multiple sclerosis, stroke, traumatic brain injury and Alzheimer's disease, cerebrovascular dysfunction allows blood proteins to extravasate into the brain. One of these blood proteins, fibrinogen, interacts with microglia and induces a pro-oxidant, pro-inflammatory cell state that contributes to disease progression. My goal is to mechanistically understand how fibrinogen alters microglia state and function, and how fibrinogen reactive microglia contribute to the progression of neurologic diseases. To investigate this, I will use transcriptomics and metabolomics to define how fibrinogen alters microglia and identify genes that regulate the microglial response to fibrinogen. By manipulating the expression of these genes, I will attempt to rescue microglia state and function and determine if this strategy can ameliorate the progression of important neurological diseases.

Benefits to Science and Society: The results of this research project will lead to a greater understating of the molecular mechanisms by which blood proteins like fibrinogen polarize microglia and contribute to neuroinflammation. Furthermore, it may establish novel methods to restore healthy microglia function and identify therapeutic targets for neurological diseases with cerebrovascular dysfunction, including multiple sclerosis, stroke, traumatic brain injury and Alzheimer's disease.

Personal Interests: I really enjoy skiing, running, and being outdoors, but my favorite pastime is cycling, whether its mountain biking, road racing or track.

ARCS Award: I am incredibly grateful and honored to be an ARCS Scholar. The support of the ARCS Foundation allows me to focus on my research and to continue tackling challenging scientific questions. I am excited to join the ARCS community and eager to engage with scholars and foundation members who share my enthusiasm for advancing scientific discovery.

WILFREDO GABRIEL GONZALEZ RIVERA

University of California San Diego

School of Medicine

Concentration: Biomedical Informatics

Specialization: Precision Medicine

Donor: Ellen Browning Scripps Foundation

Wilfredo focuses on combining genetics, genomics, and social science to understand the underlying causes of significant health disparities among individuals from underrepresented racial and ethnic groups in the United States. As a first-generation Latinx in higher education, his work emphasizes the critical need to include these underrepresented groups in genomic research to enhance the accuracy and generalizability of precision medicine for all populations.

Degrees: B.S. Industrial Biotechnology, University of Puerto Rico, Mayaguez; B.S. Computer Science, University of Puerto Rico, Mayaguez.

Awards and Honors: Biomedical Informatics Trainee of the Year award - 2025; Biomedical Informatics T15 Fellowship - 2024; Alfred P. Sloan Fellowship Award, 2022; Competitive Edge Fellowship Award, 2022.

Publications, Papers, and Posters:

D'Antonio, Matteo; Arthur, Timothy D.; **Gonzalez Rivera, Wilfredo G.**; Wu, Ximei; Nguyen, Jennifer P.; Gymrek, Melissa; Woo-Yeong, Park; Frazer, Kelly A. Genetic analysis of elevated levels of creatinine and cystatin C biomarkers reveals novel genetic loci associated with chronic kidney disease, *Human Molecular Genetics* 2025.

D'Antonio, Mateo; Arthur, Timothy D.; **Gonzalez Rivera, Wilfredo G**.; Wu, Ximei; Nguyen, Jennifer P.; Gymrek, Melissa; Woo-Yeong, Park; Frazer, Kelly A. A highly accurate risk factor-based XGBoost multiethnic model for identifying patients with skin cancer, *Nature Communications*, 2025.

D'Antonio, Matteo; **Gonzalez Rivera, Wilfredo G.**; Greenes, Robert A.; Gymrek, Melissa; Kelly A Frazer, Kelly A. Admixture mapping identifies novel complex trait associations with local ancestry in the All of Us Research Program, *ASHG Conference*, 2025

González-Rivera, W.; Yu, X.; Frazer, K.; D'Antonio, M.; Gymrek, M. Unraveling the Complexity of Social Descriptors and Genetic Variation in Precision Medicine. *CEGS Conference*, 2024.

Current Research (expanded description): The combination of population descriptors and genomic variation in Genome Wide Association Studies (GWASs) has led several studies to consider local ancestry inference (LAI), which assigns population descriptors to individual chromosomal segments, to improve trait prediction in diverse and admixed individuals. However, other studies have suggested that in most cases, LAI methods do not improve the power to identify genomic loci associated with specific traits in an admixed population likely because labeling a segment in the chromosome as ancestry-specific to a population does not capture the genetic diversity of a locus. I propose to develop and apply a pan-ancestry GWAS approach, which leverages quantitative haplotype-based coordinates rather than traditional race or ethnicity labels, to improve the power of identifying genomic loci associated with complex traits in admixed populations. I am characterizing this novel set of quantitatively defined pan-ancestry haplotypes and using principal components (PCs) coordinates derived from these as input to GWASs to accurately identify and characterize association signals across diverse populations.

Benefits to Science and Society: My approach provides a pan-ancestry framework, opening up possibilities for unraveling genetic associations in diverse populations and enhancing our understanding of complex traits. Ultimately, my work aims to increase recognition of the importance of including underrepresented racial and ethnic groups in genomic research to improve the accuracy and generalizability of GWASs for all. The outcomes of this study hold immense potential for advancing admixture science, population genetics, and precision medicine, ultimately benefiting individuals from diverse ancestral backgrounds.

Personal Interests: I am interested in exploring the world around me and looking for nice coffee shops to enjoy reading or coding.

ARCS Award: My long-term career goal is to secure a tenured research position at a Hispanic Serving Institution (HSI), preferably the University of Puerto Rico, where I can integrate my expertise in genetics, genomics, and social sciences to untangle the complex factors contributing to health disparities among underrepresented racial and ethnic groups. I aspire to develop innovative methods, strategies, and tools to study admixture populations in science, making significant contributions to the field of bioinformatics and ensuring that it is inclusive, accurate, and applicable to diverse populations. Finally, I want to make graduate research accessible to the Puerto Rican community by establishing a scholarship for economically disadvantaged Puerto Ricans who wish to pursue graduate studies in the United States. As a first-generation, low-income student from Vega Baja, Puerto Rico, I am humbled and grateful for the support of the ARCS Foundation. The award means far more to me than its financial implications, representing the promise of a robust Hispanic/Latinx STEM community that has been underrepresented for many years. Thank you for your help and generosity. I look forward to contributing to making the world a better place.

RAYYAN MOHAMMED GORASHI

University of California San Diego

Jacobs School of Engineering

Concentration: Bioengineering

Specialization: Biomaterials and Sex-specific Disease Modeling

Donor: ARCS Foundation - San Diego Chapter

Rayyan's research leverages biomaterial tools to better understand sex differences in heart valve disease. Current treatments are limited to pharmaceutical drugs or invasive, total valve replacement procedures. Drug treatments are often ineffective for females due to an incomplete understanding of female-specific disease mechanisms. Rayyan utilizes biomaterials to create physiologically relevant disease models to study sex-specific mechanisms. More broadly, Rayyan seeks to understand the sex differences in heart valve disease progression to create more equitable treatment options for both male and female patients.

Degrees: M.S. in Biomedical Engineering, Northwestern University; B.S. in Chemical and Biomolecular Engineering, Johns Hopkins University.

Awards and Honors: Siebel Scholar Class of 2026; Bouchet Graduate Honor Society; NIH NHLBI F31 Predoctoral Fellowship; Jacobs School of Engineering Research Expo, Best Poster, Bioengineering, 2023; NIH NHLBI R00 Supplemental Fellowship to Support Diversity in STEM, 2022-2024.

Publications, Papers, and Posters:

Gorashi, R.M.; Wenning, M.; Grim, J.; Walker, C.; Pena, B.; Mestroni, L.; Anseth, K.; Aguado, B. Sex-specific Valvular Myofibroblast Activation in Response to Nano-scale Stiffness Cues. Oral presentation. *Society for Biomaterials Annual Meeting*. San Diego, CA. April 2023.

Gorashi, R.M.; Rivera-Bolanos, N.; Dang, C.; Chai, C.; Kovacs, B.; Alharbi, S.; Ahmed, S. S.; Goyal, Y.; Ameer, G.; Jiang, B. Modeling Diabetic Endothelial Dysfunction with Patient-specific Induced Pluripotent Stem Cells. *Translational Medicine.* 2023. DOI:10.1002/btm2.10592.

Gorashi, R.M.; Félix Vélez, N. E.; Aguado, B. A. Chemical and Molecular Tools to Probe Biological Sex Differences at Multiple Length Scales. *Journal of Materials Chemistry.* B 2022, 10 (37), 7089–7098. DOI:10.1039/d2tb00871h.

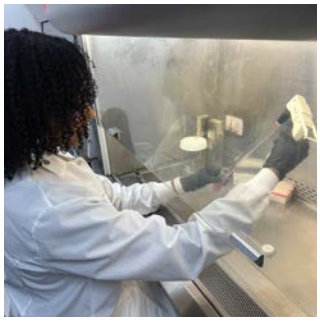
Chan, X.Y.; Volkova, E.; Eoh, J.; Black, R.; Fang, L.; **Gorashi, R.M.**; Song, J.; Wang, J.; Elliott, M. B.; Barreto-Ortiz, S.F.; Chen, J.; Lin, B.L.; Santhanam, L.; Cheng, L.; Lee, F.S.; Prchal, J.T.; Gerecht, S. HIF2A Gain-of-Function Mutation Modulates the Stiffness of Smooth Muscle Cells and Compromises Vascular Mechanics. *iScience*. 2021, 24 (4), 102246. DOI:10.1016/j.isci.2021.102246.

Current Research (expanded description): Clinical evidence suggests aortic valve stenosis (AVS) progression is sexually dimorphic in disease presentation and outcomes. For example, male aortic valves tend to develop a calcified phenotype while female valves exhibit a distinct fibrotic phenotype. The calcified phenotype is characterized by stiff, spherical calcium-phosphate nanoparticles, where particle size and abundance increase with disease progression. Previous work also suggests that X-linked and Y-linked genes and epigenetic modifiers may contribute to sex dimorphisms in valve disease. My research utilizes photo-tunable, polyethylene glycol (PEG)-based biomaterials, to model healthy and diseased microenvironments. These physiologically relevant models will allow us to identify novel X-linked and Y-linked genes implicated in the pathogenesis of AVS. I will also utilize transcriptomics to gain a better understanding of how sex chromosome linked genes impact signaling pathways involved in AVS progression. Additionally, I will incorporate stem-cell based technology into the lab by reprogramming healthy and valve disease patient blood cells into stem cells to enhance the clinical relevance of our models. Together, I will create patient-specific models of AVS and validate X-linked and Y-linked genes as novel targets for sex-specific AVS interventions.

Benefits to Science and Society: The current landscape for noninvasive heart valve disease treatment is ineffective for females due to a lack of understanding of the biological disease mechanisms. My research aims to fill that gap in knowledge by delineating the sex differences in disease progression and presentation through biomaterials-based models. By incorporating sex as a biological variable into my research, I aim to create more equitable, sex-specific treatment options for heart valve disease patients.

Personal Interests: I enjoy nature/landscape and portrait photography, surfing, working out, video games, and spending time with family.

ARCS Award: I am deeply honored and grateful to have received the ARCS Foundation award. As graduate students, we often face financial barriers that impose additional stress and hardships on our work. The ARCS Foundation award will alleviate this stress and thus allow me to progress in my studies. Additionally, I thoroughly appreciate the ARCS Foundation's emphasis on community engagement and outreach, as this is a strong passion of mine. I feel incredibly thankful to be integrated into this wonderful community of fellow ARCS scholars and professionals. I look forward to expanding my network and growing both as a person and scientist alongside my peers.



JONATHAN A. GUNN

University of California San Diego

Jacobs School of Engineering

Concentration: Bioengineering

Specialization: Immunotherapy and Nanomedicine

Donor: ARCS Foundation - San Diego Chapter

Jonathan is developing a new way to use self-amplifying RNA as a "protein factory" inside the body. By packaging this RNA into tiny particles and injecting them directly into lymph nodes, his research makes it possible to produce helpful proteins for long periods of time from just one dose. In cancer treatment, this includes proteins that attract and organize immune cells to better fight tumors. Jonathan's work could lead to more effective, affordable, and widely accessible therapies for patients.

Degrees: B.S. in Chemical and Biomolecular Engineering/Mathematics, Johns Hopkins University

Awards and Honors: UCSD Interfaces Training Fellowship (2024).

Publications, Papers, and Posters:

Katelyn Miyasaki, Sangwoo Han, Olivia Carton, Rebecca M. Kandell, **Jonathan Gunn**, Ester J. Kwon. Formulation methods for peptide-modified lipid nanoparticles, *Journal of Controlled Release.* Volume 385, 2025, 114030, ISSN 0168-3659, https://doi.org/10.1016/j.jconrel.2025.114030.

Jiang, Y.; Pacella, M. S.; Lee, S.; Zhang, J.; **Gunn, J. A.;** Vallejo, P.; Singh, P.; Hou, T.; Liu, E.; Schulman, R. Hierarchical Assembly and Modeling of DNA Nanotube Networks Using Y-Shaped DNA Origami Seeds. *Nanoscale* 2024, 16 (24), 11688–11695. https://doi.org/10.1039/D4NR01066C.

Credle, J. J.; Robinson, M. L.; **Gunn, J.;** Monaco, D.; Sie, B.; Tchir, A.; Hardick, J.; Zheng, X.; Shaw-Saliba, K.; Rothman, R. E.; Eshleman, S. H.; Pekosz, A.; Hansen, K.; Mostafa, H.; Steinegger, M.; Larman, H. B. Highly Multiplexed Oligonucleotide Probe-Ligation Testing Enables Efficient Extraction-Free SARS-CoV-2 Detection and Viral Genotyping. *Modern Pathology* 2021, 34 (6), 1093–1103. https://doi.org/10.1038/s41379-020-00730-5.

Kubi, B.; **Gunn, J.;** Fackche, N.; Cloyd, J. M.; Abdel-Misih, S.; Grotz, T.; Leiting, J.; Fournier, K.; Lee, A. J.; Dineen, S.; Dessureault, S.; Veerapong, J.; Baumgartner, J. M.; Clarke, C.; Mogal, H.; Patel, S. H.; Dhar, V.; Lambert, L.; Hendrix, R. J.; Abbott, D. E.; Pokrzywa, C.; Raoof, M.; Lee, B.; Maithel, S. K.; Staley, C. A.; Johnston, F. M.; Wang, N.-Y.; Greer, J. B. Predictors of Non-Home Discharge after Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy. *Journal of Surgical Research* 2020, 255, 475–485. https://doi.org/10.1016/j.jss.2020.05.085.

Credle, J. J.; **Gunn, J.;** Sangkhapreecha, P.; Monaco, D. R.; Zheng, X. A.; Tsai, H.-J.; Wilbon, A.; Morgenlander, W. R.; Rastegar, A.; Dong, Y.; Jayaraman, S.; Tosi, L.; Parekkadan, B.; Baer, A. N.; Roederer, M.; Bloch, E. M.; Tobian, A. A. R.; Zyskind, I.; Silverberg, J. I.; Rosenberg, A. Z.; Cox, A. L.; Lloyd, T.; Mammen, A. L.; Benjamin Larman, H. Unbiased Discovery of Autoantibodies Associated with Severe COVID-19 via Genome-Scale Self-Assembled DNA-Barcoded Protein Libraries. *Nature Biomedical Engineering* 2022, 6 (8), 992–1003. https://doi.org/10.1038/s41551-022-00925-y.

* = equal contributors

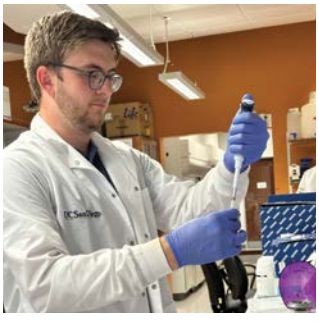
Current Research (expanded description): Jonathan's research centers on developing self-amplifying RNA (saRNA) as a local "protein factory" for durable, high-level therapeutic protein production. By formulating saRNA into lipid nanoparticles (LNPs), he is investigating strategies to deliver these constructs directly into lymph nodes, where they can function as adjuvants and immunotherapies. A key application is the expression of chemokines such as CCL19 and CCL21, which promote the recruitment and organization of dendritic cells and T cells within the tumor-draining lymph node. This approach harnesses the extended expression profile of saRNA to sustain local immune activation without the need for repeated dosing or viral integration. Beyond vaccines, Jonathan's work positions saRNA-LNPs as a broadly adaptable platform for long-term protein secretion in vivo, with the potential to enhance antitumor immunity and broaden the therapeutic landscape of immuno-oncology.

Benefits to Science and Society: Jonathan's research leverages self-amplifying RNA (saRNA) delivered by lipid nanoparticles as a local "protein factory" to sustain therapeutic protein production in vivo. By directly injecting saRNA into lymph nodes, his work enables long-term secretion of chemokines such as CCL19 and CCL21 to recruit and organize immune cells. This strategy could amplify antitumor immunity, reduce reliance on repeated or costly therapies, and broaden access to effective, durable immunotherapies—advancing both scientific innovation and equitable cancer care.

Personal Interests: Chess, tennis, pickleball, hiking, traveling.

ARCS Award: Receiving the ARCS Foundation award is a tremendous honor that signifies recognition of my work in advancing CAR therapy using mRNA technologies. This award provides crucial financial support and motivates me to continue pursuing impactful biomedical research. It connects me with a community of scholars and leaders, enhancing my opportunities for collaboration and growth.

I am deeply grateful for this trust in my potential, and I am committed to contributing meaningfully to the field of medicine. This award is not just a personal achievement but a stepping stone towards achieving my goal of becoming an independent physician-scientist.



DYLAN COLE HIRSCH

University of California San Diego

Jacobs School of Engineering

Concentration: Mechanical Engineering

Specialization: Control Theory and Reinforcement Learning

Donor: The Reuben H. Fleet Science Foundation

Today, we increasingly rely on complex algorithms to control our hardware, such as in self-driving cars and robotics. These algorithms allow such technologies to autonomously achieve feats that previously required human oversight, but they can fail in unpredictable ways, resulting in harm to people and infrastructure. Dylan's research focuses on designing algorithms to make these technologies safer by utilizing modern advancements in applied mathematics and machine learning. He is also interested in re-purposing the same algorithms for medical applications via automatically designing pharmaceutical treatment regimens that maximize patient safety.

Degree: S.M. in Biological Engineering, Massachusetts Institute of Technology; B.S. Biomedical Engineering, Johns Hopkins University.

Awards and Honors: UCSD-NIH Interfaces Scholar; MIT Biological Engineering TA of the Year; NSF Graduate Research Fellowship Program (GRFP) Recipient; NIH Intramural Research Training Award (IRTA) Recipient.

Publications, Papers, and Posters:

Hirsch, D.; Herbert, S. Approximate Hamilton-Jacobi Reachability Analysis for a Class of Two-Timescale Systems, with Application to Biological Models. Accepted to the *64th IEEE Conference on Decision and Control*; Rio de Janeiro, December 9-13, 2025, pp 3756–3763. arXiv DOI: arXiv.2503.11021.

Hirsch, D.; Herbert, S. Control of Subpopulation Fractions in a Population of Bistable Cells. To appear in *IEEE Control System Letters*.

Hirsch, D.; Grunberg, T. W.; Del Vecchio, D. Error Bound for Hill-Function Approximations in a Class of Stochastic Transcriptional Network Models. *Proceedings of the 62nd IEEE Conference on Decision and Control*, *Marina Bay Sands, Singapore*, December 13-15, 2023, pp 3756–3763. DOI: 10.1109/CDC49753.2023.10383993

Sparks, R.*; Rachmaninoff, N.*; Lau, W. W.*; **Hirsch, D. C.***, Bansal, N.*; et. al. Unified Metric of Human Immune Health. *Nature Medicine* 2024, 30 (9), 2461–2472. DOI: 10.1038/s41591-024-03092-6.

Current Research (expanded description): y research focuses on designing safer algorithms for technologies which utilize computers to make important decisions. For example, in self-driving cars, complex neural networks make decisions determining how to steer, break, and accelerate. The rapid advancement in robotics has also required neural networks to allow robots to autonomously navigate and operate in factories and industrial settings, often around human workers. Similar to Large Language Models, neural networks used for controlling machines tend to have impressive average performance, but "hallucinations" can result in perplexing and dangerous worst-case performance.

To solve this issue, one can use safety filters, algorithms that predict potential danger and switch to a safer backup algorithm. It is often unclear, however, when to switch algorithms and what the safe algorithm should do. Advances in applied mathematics and computing are now allowing us to use mathematical models of a technological system to automatically synthesize these safety filters. While these algorithms currently work very well for "small" models, they are computationally intractable for more complex, realistic models.

My research centers on bridging this gap. Unexpectedly, the same mathematics shows promise in designing safe pharmaceutical treatments in computational pharmacology, which is now one of my application domain focuses.

Benefits to Science and Society: My research will help design algorithms that make the increasingly autonomous and ubiquitous technologies around us safer. In addition, my research into pharmacological applications will help us take a more algorithmic approach to drug regimen design and clinical decision-making. In both cases, the goal is to use applied mathematics and computing to build technologies we can trust, despite the rapid increase in AI technologies we do not yet understand.

Personal Interests: In my free time, I like running, cooking, and watching movies.

ARCS Award: I am honored to be an ARCS scholar, and I am deeply grateful for the ARCS Foundation's support of science and engineering research. I am passionate about designing mathematically rigorous computational methods to help make our technologies safer and more reliable, and I believe that the research my field is doing is fundamental to addressing critical safety shortcomings in a world increasingly driven by "black-box" algorithms. Through its outreach, the ARCS Foundation is helping make this kind of work possible.

This award provides critical resources to help myself and others improve and present our work, learn from and collaborate with other researchers, and ideate new important research directions. I am also greatly appreciative of the Foundation's recognition of my efforts to advance engineering knowledge and use these advancements to improve society. It is a true privilege to be part of this community and its mission

KATHERINE EUGENIA IZHIKEVICH

University of California San Diego

Jacobs School of Engineering

Concentration: Computer Science

Specialization: Computer Security

Donor: Ellen Browning Scripps Foundation

Katherine studies how to detect attackers in enterprise networks before they cause data breaches or ransomware attacks. She is currently building a system that detects, in real time, when an attacker is planning their next attack on a given enterprise. The scientific contribution of this system lies in differentiating between benign behaviors (e.g., employees simply checking their email), misconfigured behaviors (e.g., TVs attempting to connect to every device on the network), and malicious behaviors (e.g., attackers looking for vulnerabilities to exploit).

Degrees: M.S. in Computer Science, University of California, San Diego; B.S. in Mathematics-Computer Science, University of California, San Diego.

Awards and Honors: UCSD CSE MS to PhD Department Fellowship (2024); UCSD CSE Masters Award for Excellence in Research (2024); Stephen L. Squires Scholar (2023); Gary C Reynolds Scholar (2021).

Publications, Papers, and Posters:

Izhikevich, K.; Voelker, G. M.; Savage, S.; Izhikevich, L. Using Honeybuckets to Characterize Cloud Storage Scanning in the Wild. *In Proceedings of the 9th IEEE European Symposium on Security and Privacy*, Vienna, Austria, July 2024.

Du, B.; **Izhikevich, K.;** Rao, S.; Akiwate, G.; Testart, C.; Snoeren, A.; Claffy, K. IRRegularities in the Internet Routing Registry. *In Proceedings of the 23rd ACM Internet Measurement Conference*, Montréal, Canada, 2023.

Pekar, J. E.; Magee, A.; Parker, E.; Moshiri, N.; **Izhikevich, K.;** Havens, J. L.; Gangavarapu, K.; Malpica Serrano, L. M.; Crits-Christoph, A.; Matteson, N. L.; Zeller, M.; Levy, J. I.; Wang, J. C.; Hughes, S.; Lee, J.; Park, H.;

Park, M. S.; Ching Zi Yan, K.; Tzer Pin Lin, R.; Mat Isa, M. N.; Muhammad Noor, Y.; Vasylyeva, T. I.; Garry, R. F.; Holmes, E. C.; Rambaut, A.; Suchard, M. A.; Andersen, K. G.; Worobey, M.; Wertheim, J. O. The Molecular Epidemiology of Multiple Zoonotic Origins of SARS-CoV-2. *Science* 2022, DOI: 10.1126/science.abp8337.

Current Research (expanded description): My current research objective focuses on detecting Internal Reconnaissance. After an attacker gains control of an account or device within a network (e.g., via phishing), they achieve situational awareness by performing Internal Reconnaissance, using various tools to determine their next target or attack path within the network they wish to compromise. My work currently comprises two projects: (1) an analysis of real network traffic to measure the differences between benign, misconfigured, and malicious infrastructure on any network, and (2) an active approach using honeypots to detect unauthorized probing of infrastructure (e.g., honeyaccounts, honeymachines, honey IP addresses). To carry out these projects, I collaborate with UCSD's IT services to study network data and deploy honeyitems in our university's diverse network of 50,000 users (students, staff, faculty, and visitors) and host/network management. I also have access to similar data from 10 other enterprises, increasing network diversity (e.g., banks, hospitals). My work is novel because it is built upon real data, rather than simulations like prior research. The unfortunate truth is that networks are too complex to be accurately represented by simulations, which often fail to account for misconfigured or deprecated devices still connected to the network.

Benefits to Science and Society: As the Internet continues to expand, the benefits introduce new dangers. Namely, data breaches and ransomware attacks are becoming more frequent. My research seeks to intercept attackers before they can complete their nefarious purposes, hence prevent data breaches from revealing vital information (e.g., Social Security Numbers) or prevent ransomware attacks from taking human lives (e.g., hospitals affected by ransomware attacks).

Personal Interests: I was a ballerina for 16 years, but have recently become a runner. I love to read and creatively write.

ARCS Award: Thank you very much for recognizing my accomplishments and selecting me as an ARCS Scholar! ARCS support will help me attend multiple conferences in the coming year. This academic year, I will be traveling to the 2024 Internet Measurement Conference in Madrid, Spain; the 2025 Usenix Security in Seattle; and possibly the 2025 Computer Science-Law conference in Munich, Germany, thanks in part to ARC's generous support. By being able to attend these conferences, the ARCS Foundation will directly help me with my future career as I plan to be on the faculty job market during the last year of my Ph.D. (approximately 2028). Being able to attend these conferences will allow me to advertise my work and more broadly network. Thanks for supporting local scientists!

SARAH LANE KO

University of California San Diego

Jacobs School of Engineering

Concentration: Materials Chemistry

Specialization: Energy Storage Materials and NMR Crystallography

Donor: Kathryn Crippen Hattox Endowment

A major component in the mitigation of global warming is the advancement of sustainable and efficient energy storage. Sarah investigates the synthesis and structure of novel materials for use as lithium-ion battery electrodes for the improvement of energy storage materials. She seeks to understand the charge storage mechanisms in unique new materials and the synthetic mechanisms to access these materials, with the goal of utilizing this understanding to improve batteries towards longer lifetimes, higher capacities, and faster charging.

Degree: B.S. in Chemistry, University of California, Los Angeles.

Awards and Honors: Sustainable Power and Energy Center (SPEC) Summer Research Award, UC San Diego, 2025; Distinguished Graduate Student Fellowship, UC San Diego, 2024-2025; Materials Chemistry Distinguished Graduate Award, UC San Diego, 2023; Ramsey Award for Excellence in Research, UC Los Angeles, 2022.

Publications, Papers, and Posters:

Ko, S. L.; Dorrell, J.; Alter, E.; Ta A.; Morris, A. J.; Griffith, K. J. Extreme Defect Tolerance for Electrochemical Intercalation in Wadsley–Roth Structures Demonstrated by Metastable NaNb7O18. *J. Am. Chem. Soc*. 2025, 147, 8513–8522. jacs.4c16977. https://doi.org/10.1021/jacs.4c16977.

Ko, S. L.; Dorrell, J. A.; Morris, A. J.; Griffith, K. J. Metastable Layered Lithium-Rich Niobium and Tantalum Oxides via Nearly Instantaneous Cation Exchange. *Faraday Discuss*. 2025, 255, 429–450. https://doi.org/10.1039/D4FD00103F

Ridley, P.; Duong, G.; **Ko, S. L.**; Sam Oh, J. A.; Deysher, G.; Griffith, K. J.; Meng, Y. S. Tailoring Chloride Solid Electrolytes for Reversible Redox. *J. Am. Chem. Soc. 2025*, 147 (23), 19508–19519. https://doi.org/10.1021/jacs.4c14670

Current Research (expanded description): Lithium-ion batteries are a significant factor in the global push towards clean and efficient energy technologies, as the industry standard for grid and vehicle energy storage. With current lithium-ion batteries reaching their theoretical capacities, new approaches are required for future energy storage. There are a vast amount of unexplored chemistries and crystal structures with the potential to be safer, cheaper, or more efficient alternatives to the current battery chemistries.

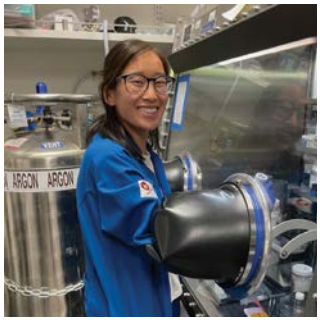
I investigate the reaction pathways and structural chemistry of complex oxides and heteroanionic materials with an emphasis on the use of soft chemical synthetic methods, such as hydro/solvothermal, molten salt fluxes, and ion exchange to access metastable phases. The structure of novel compounds is characterized with a combination of various techniques, including X-ray diffraction, X-ray absorption spectroscopy, neutron diffraction, scanning electron microscopy, and solid-state nuclear magnetic resonance.

The electrochemical performance of these novel battery materials is characterized in half-cell coin cells by cycling an electrode of the material against lithium. Rate testing and cycle life testing are used to determine capacity retention and reversibility of the material, and electrochemical analyses such as differential capacity are performed to extract information on mechanisms such as phase transitions upon lithiation or delithiation.

Benefits to Science and Society: Improvements in rechargeable batteries will help mitigate the damaging effects of climate change and shift society away from reliance on fossil fuels. Cleaner and more efficient energy storage will also improve access to reliable energy in rural and underserved areas. Exploring new chemistries also allows for reduction in the use of harmful or toxic elements in batteries such as cobalt, nickel, and lead, leading to batteries that are safer to both manufacture and use.

Personal Interests: In my free time, I enjoy reading, baking, singing, trying new coffee shops, listening to music, and hanging out with my dogs.

ARCS Award: I am incredibly grateful to the ARCS foundation for their support and honored to be a recipient of this award. I am excited for the opportunities to network and grow in this community, and I am very thankful for financial support in a time where academic funding is so uncertain.



BENJAMIN AARON LAM

University of California San Diego

Jacobs School of Engineering

Concentration: Chemical Engineering

Specialization: Nanoengineering and Nanotechnology

Donor: Donald C. and Elizabeth M. Dickinson Foundation

Benjamin's research focuses on the intersection of chemical engineering, nanotechnology, and materials science with the goal of advancing medical device technologies and improving human health. His current research focuses on understanding the nanoscale interactions between peptides and nanoparticles in their assembly and disassembly and developing computational tools to explain the experimental phenomena through molecular simulations. These discoveries offer knowledge that would enhance peptide-based therapeutics, drug discovery, diagnostics, environmental monitoring, and nanotechnology.

Degrees: M.S. in Chemical Engineering, University of California, San Diego; B.S. in Chemical Engineering, University of California, San Diego.

Awards and Honors: Aiiso Yufeng Li Family Department of Chemical and Nano Engineering Fellowship (2023), UC San Diego Summa Cum Laude Honors Recipient (2022), UC San Diego Scholar Award (2022), UC San Diego Regents Scholar (2018-2022).

Publications, Papers, and Posters:

Lam B., Ramji R., Mullooly M., Closser K. D., Pascal T. A., Jokerst J. V. Mechanism of Cationic Peptide-Induced Assembly of Gold Nanoparticles: Modulation of Electrostatic Repulsion. *Aggregate* 2025, e70043. https://doi.org/10.1002/agt2.70043.

Lam, B.; Amer, L.; Thompson, E.; Clark, A. E.; Garretson, A. F.; Carlin, A. F.; Chen, C.; Jokerst, J. V.; Retout, M. A Matrix-Insensitive Approach for Sensor Arrays: Example of Rapid Saliva Screening for Bacteria, Fungi, and Viruses in Oral and Respiratory Diseases. *ACS Applied Materials & Interfaces* 2024, 10.1021/acsami.4c15662.

Lam, B.; Retout, M.; Clark, A. E.; Garretson, A. F.; Carlin, A. F.; Jokerst, J. V. Silver Nanoparticle Sensor Array for the Detection of SARS-CoV-2. *ACS Appl. Nano Mater*. 2024, 7 (8), 9136–9146. https://doi.org/10.1021/acsanm.4c00654

Retout, M.; Amer, L.; Yim, W.; Creyer, M. N.; **Lam, B.**; Trujillo, D. F.; Potempa, J.; O'Donoghue, A. J.; Chen,C.; Jokerst, J. V. A Protease-Responsive Polymer/Peptide Conjugate and Reversible Assembly of Silver Clusters for the Detection of Porphyromonas Gingivalis Enzymatic Activity. *ACS Nano* 2023, 17 (17), 17308–17319. https://doi.org/10.1021/acsnano.3c05268

Current Research (expanded description): Benjamin studies the principles behind the nanoscale interactions between peptides and nanoparticles to overcome present-day materials limitations. The properties of the nanoparticles change when they assemble and disassemble, but the mechanism of interaction between the peptides and the nanoparticles is not well understood. By examining the effects of the peptide sequence, size, and structure, Benjamin's research will create new knowledge regarding more precise control of peptide interactions with nanoparticles that will enhance the development of materials with tailored properties. He also currently collaborates with Professor Tod Pascal's group to develop computational tools to explain the experimental phenomena through molecular simulations. His work will result in better performing predictive models that can forecast peptide-nanoparticle interactions based on peptide sequences and nanoparticle properties. This would facilitate not only the speed of discovery but also the efficacy of future peptide-based therapeutics. The design of more precisely controlled nanoparticle-based systems would also minimize side-effects and improve the quality of life for patients. Other potential implications of his work include more accurate diagnostics, lower cost environmental monitoring, and higher capacity batteries that would promote equity and sustainability.

Benefits to Science and Society: My research benefits science and society by developing foundational knowledge for controlling the interactions of nanoparticles with peptides via steric and electrostatic forces. This work has broader implications for the benefit of society since nanoparticle assembly and disassembly underlies many technologies, such as quantum dot televisions, diagnostic tests, and vaccines. The knowledge and computational tools resulting from my work can also be used to monitor and control the activity of enzymes that would enhance biomanufacturing.

Personal Interests: In my free time, I enjoy volunteering, being outdoors, and spending time with family and friends.

ARCS Award: The ARCS Foundation award means a lot to me as I am able to join a community of researchers who push the boundaries of innovation to make the world a better place for all. This award not only validates my hard work, dedication, and achievements, but it also provides me the momentum to use my knowledge and passion to broaden the impact of my work in the years to come. I would like to express my sincere gratitude to the generous donors on the ARCS Foundation. This award will significantly alleviate the financial burden associated with my education and allow me to focus more on my research and extracurricular activities. I am deeply grateful for the opportunities this award opens up for me and the doors it unlocks for my future endeavors.

ARAZ MAJNOONIAN

University of California San Diego

Herbert Wertheim School of Public Health and Human Longevity Science

Concentration: Global Health

Specialization: Gender-Based Violence Prevention

Donor: ARCS Foundation - San Diego Chapter

Araz is conducting pioneering research to evaluate domestic violence support services nationwide in Armenia. Her study, the first of its kind in the country, adopts a participatory approach involving survivors of violence, domestic violence support center staff, and partner organizations to assess the impact and accessibility of these services. By generating evidence-based insights and recommendations, her research aims to enhance support for survivors and inform policy and practice. Her work contributes to the global fight against gender-based violence, offering valuable lessons for low and middle-income countries.

Degree: B.S. in Public Health, University of California San Diego.

Awards and Honors: Completion of Research and Creative Activity Fellowship, College of Graduate Studies & the Division of Research and Innovation, San Diego State University, 2025; Merkin Dissertation Fellowship, Department of Graduate Affairs, UC San Diego, 2025.

Publications, Papers, and Posters:

Majnoonian, A.; Ghevondyan, S.; Al-Rousan T. Evaluating Domestic Violence Support Services in Armenia: Insights from Service Providers. Poster presentation. *UC San Diego Public Health Research Day*. La Jolla, CA. May 2025.

Majnoonian, A.; Tamamian C; Ovanesian M; Al-Rousan T. Food insecurity among displaced populations in Armenia during the 2020 Nagorno-Karabakh conflict. *Front. Public Health*. 2024. 12:1499523. doi: 10.3389/fpubh.2024.1499523.

McDougal, L.; **Majnoonian, A.**; Stone, G.; Fielding-Miller, R. Determinants of Parent-reported Child Mental Health Status in San Diego Public Schools During the Height of the COVID-19 Omicron Outbreak: A Serial Cross-sectional Study. *PLOS ONE*. 2023, 18 (7). https://doi.org/10.1371/journal.pone.0288628

Vo, A.; **Majnoonian, A.**; Ni, J.; Hassani, A.; Wijaiya, C.; Duong, D.; Nguyen, M.; Flores, M.; Omaleki, V.; Le, T.; Fielding-Miller, R. Challenges of COVID-19 Case Investigation and Contact Tracing in School Settings. *Journal of School Health*. 2023, 93(5): 353–359.

Current Research (expanded description): I am currently working collaboratively with a non-governmental organization in Armenia to evaluate domestic violence support services nationwide. The project includes process, impact, and outcome evaluations to identify gaps and improve procedures, ensuring better responses, justice, and social protection for survivors. Using community-based participatory evaluation, we aim to co-create a conceptual framework for evaluating support services, ensuring that both survivor-defined and system-defined goals are addressed. This involves a participatory process that actively engages community stakeholders, support center staff, and survivors of domestic violence.

The evaluation will assess the effectiveness, accessibility, and impact of support services on domestic violence survivors. We will utilize a mixed-methods participatory approach, combining quantitative and qualitative data collection and analysis techniques to capture the perspectives of survivors, staff, and stakeholders. We aim to disseminate our findings and recommendations widely to policymakers, government agencies, NGOs, and the broader community. Through this research, we hope to contribute significantly to understanding the complexities of domestic violence support services, ultimately improving the lives of survivors and informing policies and programs in Armenia and other low and middle income countries.

Benefits to Science and Society: This research contributes to science and society by introducing a comprehensive evaluation framework for domestic violence support services, utilizing participatory methodologies. By adopting a community-based participatory research approach, this research fosters collaboration, strengthens local capacities, and generates evidence that can inform policy, empower survivors, and contribute to the broader global understanding of effective strategies for combating gender-based violence in diverse cultural contexts. The research benefits society by enhancing the quality and relevance of support services for domestic violence survivors in Armenia.

Personal Interests: I love outdoor adventures that include chasing waterfalls, climbing rocks, and traveling. I also like to spend time volunteering with human rights advocacy organizations.

ARCS Award: I am honored to be selected as a recipient of the ARCS Foundation award. As an Armenian woman, first-generation scholar, and immigrant, this recognition means the world to me. It represents not only financial support but also a validation of my journey and the potential impact of my work. Throughout my academic path, I've encountered various challenges, from navigating a new country's educational system to overcoming financial barriers. The generous support from organizations like the ARCS Foundation has been instrumental in overcoming these obstacles and reaching where I am today.

DANIEL MILSHTEYN

University of California San Diego

Physical Sciences

Concentration: Chemistry and Biochemistry

Specialization: Lipid Biochemistry and Biophysics

Donor: ARCS Foundation - San Diego Chapter

Daniel studies the regulation of negatively curved lipids in cell membrane dynamics and environmental adaptation. His primary research focuses on the biophysical roles of cholesterol in mitochondrial fission driven by multi-organelle contacts. In addition, he collaborates with scientists from the Extreme Biophysics Research Coordination Network to understand the roles of lipids in adapting model organisms to survive in deep-sea or high-pressure environments. Daniel is training in interdisciplinary approaches including super resolution live-cell microscopy, membrane biophysics, and synthetic biology to understand the implications of lipid composition across scales from cell membranes to organismal physiology and disease.

Degrees: M.S. in Chemistry, University of California, San Diego; B.S. in Biomolecular Engineering, University of California, Santa Cruz.

Awards and Honors: Graduate Research Fellowship Program Honorable Mention, National Science Foundation 2022; Interfaces Graduate Training Grant 2021-2023; San Diego Fellow 2022.

Publications, Papers, and Posters:

Winnikoff J, **Milshteyn D**, Vargas-Urbano SJ , Pedraza MA, Armando AM , Quehenberger O, Sodt A ,Gillilan RE, Dennis EA, Lyman E, Haddock SHD, Budin I. Homeocurvature adaptation of phospholipids to pressure in deep-sea invertebrates. *Science.* 2024.

Venkatraman K, Lee CT, Garcia GC, Mahapatra A, **Milshteyn D**, Perkins G, Kim KY, Pasolli HA, Phan S, Lippincott-Schwartz J, Ellisman MH, Rangamani P, Budin I. Cristae formation is a mechanical buckling event controlled by the inner membrane lipidome. *EMBO J.* 2023 Nov 7;:e114054. PMID: 36993370; PMCID: PMC10054968.

Moore W.M.; **Milshteyn D.**; Tsai Y.T.; Budin I. Engineering the Bilayer: Emerging Genetic Toolkits for Mechanistic Lipid Biology. *Curr. Op. in Chemical Biology.* 2021, 65, 66-73. https://doi.org/10.1016/j.cbpa.2021.05.013

Milshteyn D.; Cooper G.; Deamer D. W. Chemiosmotic Energy for Primitive Cellular Life: Proton Gradients are Generated Across Lipid Membranes by Redox Reactions Coupled to Meteoritic Quinones. *Scientific Reports.* 2019, 9(1). https://doi.org/10.1038/s41598-019-48328-5

Current Research (expanded description): Cholesterol is a major component of mammalian diet and physiology, yet little is known about its contributions to mitochondrial dynamics, in which mitochondrial network fission and fusion rates are balanced for a cell's energy production. Recent studies have implicated proteins involved in the exchange of phospholipids between multiple organelles preceding mitochondrial fission, but the involvement of cholesterol in this process has not yet been demonstrated. By employing methods across membrane biophysics, cell biology, and protein biochemistry, I am investigating the importance of cholesterol in mitochondrial membranes, its biophysical contributions to membrane fission, and how dysregulation of mitochondrial cholesterol may impact human health. In addition, I study how deep-sea organisms adapt to the crushing hydrostatic pressures found descending down to the bottom of the ocean. Collaborating with biophysicists and marine biologists, I metabolically engineer the production of lipid biomarkers detected in deep-sea comb jellies into laboratory bacteria and yeast model microorganisms. By growing these engineered microorganisms in high-pressure chambers, I assay what lipids help confer survival and growth in high-pressure environments. To understand the biophysical mechanisms by which lipids aid in this adaptation, I employ lipidomics and Small Angle X-ray Scattering to uncover fundamental lipid properties that can then be generalized and applied to understanding cellular biology and organismal physiology.

Benefits to Science and Society: Lipids are an understudied macromolecule, when compared to the body of knowledge encompassing proteins and DNA. Conducting fundamental research in the biochemistry and biophysics of membranes within the context of mitochondrial fission and environmental adaptation may have broader impacts on treating metabolic diseases and understanding the effects of climate change on marine organisms, respectively.

Personal Interests: In my free time, I enjoy listening to music, getting lost in nature, and roller skating.

ARCS Award: It is an immense privilege and honor to be named an ARCS Scholar. Receiving the award is both humbling and empowering, motivating me to continue pursuing my passions in scientific research. Being recognized as an ARCS Scholar connects me to a network of individuals within the scientific and local communities that are dedicated to benefiting science and society through their support of research and education. I hope to take advantage of this network and the opportunities it provides to grow as an individual and scientist, and to then contribute back to my communities through mentorship, outreach, and scientific advancement.

SPENCER LOUIS NELSON

University of California San Diego

Physical Sciences

Concentration: Biochemistry and Molecular Biophysics

Specialization: Protein Ubiquitination

Donor: ARCS Foundation - San Diego Chapter

Spencer studies the biophysical impact and regulatory roles of protein ubiquitination through the use of novel ubiquitinated-protein purification techniques. His primary research focus explores how differing ubiquitin chains can alter the aggregation, degradation and toxicity of amyloidogenic proteins, particularly those related to neurological disorders such as Alzheimer's and Parkinson's disease. Through his research, he aims to elucidate the specific consequences of protein ubiquitination for aggregating proteins and hopes this will aid in the development of novel therapeutics utilizing targeted protein degradation strategies.

Degrees: M.S. in Chemistry, University of California San Diego; B.S. in Chemistry, University of California San Diego.

Awards and Honors: 2023-24 Teddy Traylor Award; 2023-24 Distinguished Student Fellowship; 2023-24 Molecular Biophysics Training Grant.

Publications, Papers, and Posters:

Yu, C.; **Nelson, S. L.**; Meisl, G.; Ghirlando, R.; Deshmukh, L. Phase Separation and Fibrillization of Human Annexin A7 Are Mediated by Its Proline-Rich Domain. *Biochem*. 2023, 62 (21), 3036-3040. DOI: 10.1021/acs.biochem.3c00349.

Nelson, S. L.; Li, Y.; Chen, Y.; Deshmukh, L. Avidity-Based Method for the Efficient Generation of Monoubiquitinated Recombinant Proteins. *J. Am. Chem. Soc.* 2023, 145 (14), 7748-7752. DOI: 10.1021/jacs.3c01943.

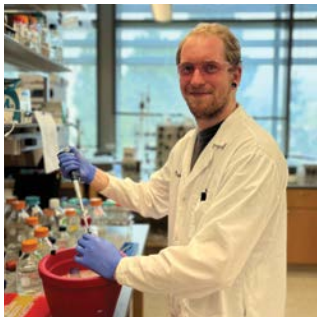
Ramaraju, B.; **Nelson, S. L.**; Zheng, W.; Ghirlando, R.; Deshmukh, L. Quantitative NMR Study of Insulin-Degrading Enzyme Using Amyloid-β and HIV-1 p6 Elucidates Its Chaperone Activity. *Biochem*. 2021, 60 (33), 2519-2523. DOI: 10.1021/acs.biochem.1c00342.

Current Research (expanded description): Amyloidogenic proteins are prone to aggregation and formation of insoluble fibrils, a hallmark of numerous neurodegenerative diseases including Parkinson's, Alzheimer's, and amyotrophic lateral sclerosis (ALS). Amyloidogenic proteins, including Parkinson's Alpha-Synuclein, Alzheimer's Aβ40, and ALS's TDP43, are often post-translationally modified by ubiquitin for degradation through the ubiquitin proteasome system (UPS), and their fibril aggregates are also observed to be highly ubiquitinated. However, there is limited information on how ubiquitin and different ubiquitin chains impact amyloidogenic proteins aggregation, degradation, and toxicity. This is in part due to the dynamic nature of protein ubiquitination in cells making it challenging to study in vivo, and the difficulty of preparing sufficient yields and purity of ubiquitinated substrate to study in vitro. To this end, we have developed a novel purification technique that enables the selective purification of ubiquitinated substrate with specific chain lengths and linkage types and have demonstrated its efficacy by purifying mono- and di-(K63 linked) ubiquitinated alpha-synuclein and abeta40. By utilizing this novel approach, we aim to characterize the biophysical impact that occurs when amyloidogenic proteins related to these neurodegenerative diseases are decorated with differing ubiquitin chains.

Benefits to Science and Society: The neurodegenerative diseases Parkinson's and Alzheimer's impact nearly 8 million people in the United States alone and this number is expected to double in the next 25 years. Drugs that manipulate protein ubiquitination are potential therapeutic strategies for treating these types of diseases, however, fundamental knowledge regarding ubiquitin's relationship with these diseases is lacking. We aim to bridge the gap between the interplay of ubiquitination, aggregation, degradation and toxicity of disease related proteins in these neurological disorders.

Personal Interests: When I'm not in the lab I enjoy watching anime or tending to my collection of carnivorous tropical pitcher plants.

ARCS Award: I am deeply honored to be awarded the ARCS Foundation Award. Receiving this award is a profound recognition of the hard work and dedication that went into my research, and I am truly grateful for this acknowledgment. I would like to extend a heartfelt thanks to the ARCS Foundation and all the donors for valuing and celebrating scientific progress in this way. I appreciate the opportunity to further connect with the other amazing graduate students at UC San Diego and members of the greater scientific community.



RENNY KA HANG NG

University of California San Diego / San Diego State University

Division of Biological Sciences

Concentration: Biological Sciences

Specialization: Olfaction

Donor: Virginia Lynch Grady Endowment

Day/night cycles impact both physiology and behavior to help animals adapt to rhythmic environmental cues, but it is unclear whether primary chemosensory neurons (including neurons which mediate the sense of smell) respond to stimuli in a rhythmic way to then guide rhythmic behaviors. Renny studies the context-dependent neuromodulation of olfaction, and his current research project characterizes how day/night cycles modulate olfactory acuity and odor-guided behaviors. His research reveals how neuromodulatory impairment in the sensory periphery can gate day/night-regulated behaviors, apart from the influence of central circadian mechanisms.

Degrees: B.S. in Physiology and Neuroscience, University of California, San Diego; B.A. in Sociology, University of California, San Diego.

Awards and Honors: Pathways in Biological Sciences (PiBS) Program Trainee, 2024-present; NSF GRFP Honorable Mention, 2024.

Publications, Papers, and Posters:

Verschut, T. A.; **Ng, R.**; Doubovetzky, N. P.; Calvez, G. L.; Sneep, J. L.; Minnaard, A. J.; Su, C.-Y.; Carlsson, M. A.; Wertheim, B.; Billeter, J.-C. Aggregation pheromones have a non-linear effect on oviposition behavior in Drosophila melanogaster. *Nature Communications* 2023, 14 (1). https://doi.org/10.1038/s41467-023-37046-2

Scalzotto, M.; **Ng, R.**; Cruchet, S.; Saina, M.; Armida, J.; Su, C.-Y.; Benton, R. Pheromone sensing in Drosophila requires support cell-expressed Osiris 8. *BMC Biology* 2022, 20 (1). https://doi.org/10.1186/s12915-022-01425-w

Zhang, Y.; **Ng, R.;** Neville, M. C.; Goodwin, S. F.; Su, C.-Y. Distinct roles and synergistic function of FRUM isoforms in drosophila olfactory receptor neurons. *Cell Reports* 2020, 33 (11), 108516. https://doi.org/10.1016/j.celrep.2020.108516

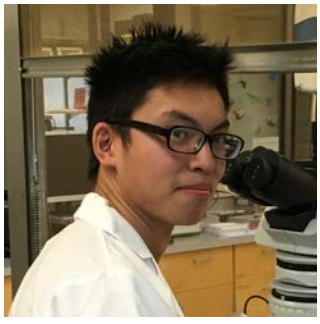
Ng, R.; Salem, S. S.; Wu, S.-T.; Wu, M.; Lin, H.-H.; Shepherd, A. K.; Joiner, W. J.; Wang, J. W.; Su, C.-Y. Amplification of drosophila olfactory responses by a DEG/ENAC channel. *Neuron* 2019, 104 (5), 947-959.e5. https://doi.org/10.1016/j.neuron.2019.08.041

Current Research (expanded description): Day/night cycles profoundly impact both physiology and behavior, thereby allowing animals to adapt to fluctuating environmental cues. Daily rhythmic behaviors are believed to be patterned by clock neurons in the central nervous system, but importantly, primary sensory neurons in the peripheral nervous system can also exhibit rhythmic physiology. However, the functional significance of such peripheral neuromodulation on rhythmic behaviors remains undetermined. Of particular interest, it is unclear whether olfactory receptor neurons (ORNs) indeed display odor-induced response rhythmicity. Thus, it remains undetermined if olfactory acuity in the fruit fly Drosophila melanogaster fluctuates in response to day/night cycles, and whether or which odor-guided behaviors are regulated by such circadian neuromodulation. What are the neuromodulatory mechanisms by which day/night cycles dynamically modulate olfactory acuity and odor-guided behavior in Drosophila? My research addresses this question by employing a multidisciplinary approach—including Drosophila genetics, electrophysiology, pharmacology, immunohistochemistry, and behavioral assays—to characterize how day/night cycles affect olfactory acuity and odor-guided behaviors.

Benefits to Science and Society: Insights from my research will advance our understanding of how peripheral sensory acuity is regulated by day/night cycles to then impart rhythmicity to behaviors. While rhythmic behaviors are believed to be patterned by central clock neurons, my research will uncover how modulation of the sensory periphery affords flexibility to circadian behaviors, which are no longer constrained by rhythmic patterns generated by central clocks. The idea that peripheral sensory neuromodulation is prerequisite for day/night behavioral regulation is conceptually innovative.

Personal Interests: Hiking, camping, marksmanship.

ARCS Award: The ARCS Foundation is a wonderful encouragement to me, as it clearly reveals the strong support and trust many individuals have chosen to show towards my career as a scientist. It is a great privilege to know there are many are invested in my success.



RENEE ELIZABETH OLES

University of California San Diego

School of Medicine

Concentration: Biomedical Sciences

Specialization: Microbial Genetics and Genomics

Donor: The Reuben H. Fleet Foundation

Renee is investigating how gut inflammation affects beneficial bacteria in our intestines and whether these changes worsen diseases like Inflammatory Bowel Disease. She focuses on a common gut bacterium called *Bacteroides fragilis,* which usually helps keep our gut healthy. Renee studies how this bacterium adapts to the stressful conditions of inflammation, such as exposure to harmful oxygen molecules. By understanding these bacterial changes, her research aims to uncover new ways to treat or prevent Inflammatory Bowel Disease, ultimately improving gut health and patient outcomes.

Degrees: B.S. in Biology, Purdue University.

Awards and Honors: Rheumatic Diseases Research Training Grant, 2023-2024, Purdue Biological Sciences Research Scholarship, 2020-2021, ABRCMS Poster Award, 2019, Purdue Presidential Undergraduate Scholarship, 2017-2021.

Publications, Papers, and Posters:

Oles, R.E.; Carrillo Terrazas, M.; Loomis, L.R.; Hsu, C.-Y.; Tribelhorn, C.; Belda-Ferre, P.; Ea, A.C.; Bryant M.; Young, J.A.; Carrow, HC.; Sandborn, W.J.; Dulai, P.S.; Sivagnanam, M.; Pride D.; Knight R.; Chu, H. Pangenome comparison of Bacteroides fragilis genomospecies unveils genetic diversity and ecological insights [Poster presentation]. Presented at: *ASM Microbe Conference;* June 2024; Atlanta, GA.

Oles, R.E.; Carrillo Terrazas, M.; Loomis, L.R.; Hsu C.-Y.; Tribelhorn, C.; Belda-Ferre, P.; Ea, A.C.; Bryant, M.; Young, J.A.; Carrow, HC.; Sandborn, W.J.; Dulai, P.S.; Sivagnanam, M.; Pride, D.; Knight, R.; Chu, H. 2024. Pangenome comparison of Bacteroides fragilis genomospecies unveils genetic diversity and ecological insights. *mSystems* 9:e00516-24.

Buzun, E.; Hsu, C-Y.; Sejane, K.; **Oles, R.E.**; Vasquez Ayala, A.; Loomis, L. R.; Zhao, J.; Rossitto, L.-A.; McGrosso, D.M.; Gonzalez, D.J.; Bode, L.; Chu, H. 2024. A bacterial sialidase mediates early-life colonization by a pioneering gut commensal. *Cell Host Microbe* 32:181-190.e9.

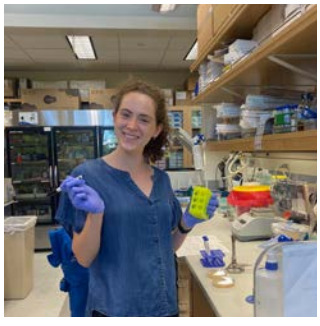
Vasquez Ayala, A., Hsu, C.-Y.; **Oles, R.E.**; Matsuo, K.; Loomis, L.R.; Buzun, E.; Carrillo Terrazas, M.; Gerner, R.R.; Lu, H.-H.; Kim, S.; Zhang, Z.; Park, J.H.; Rivaud, P.; Thomson, M.; Lu, L.-F.; Min, B.; Chu, H. 2024. Commensal bacteria promote type I interferon signaling to maintain immune tolerance in mice. *J Exp Med* 221:e20230063.

Current Research (expanded description): I specialize in bioinformatics and microbiology research, focusing on host-microbe interactions and microbial genetic variability in health and disease. Using bacterial pangenomic tools, I study how closely related bacterial strains may have drastically different impacts due to variable gene content. My current research investigates how gut inflammation drives evolution in commensal bacteria, specifically Bacteroides fragilis, and whether these genetic changes exacerbate diseases like Inflammatory Bowel Disease (IBD). By evolving B. fragilis strains using both in vitro (laboratory) and in vivo (animal model) models of inflammation, I aim to characterize the transcriptional and metabolic responses of these bacteria to inflammatory conditions. This involves assessing how exposure to reactive oxygen species—byproducts of inflammation—induces genetic adaptations in B. fragilis. I also evaluate the impact of these evolved bacterial strains on gut inflammation to determine if they contribute to disease progression.

Benefits to Science and Society: This research has important implications for understanding how generally beneficial microbes may become harmful in certain environments, potentially leading to new therapeutic strategies targeting the gut microbiota to prevent or treat diseases like IBD. Additionally, my work involves developing computational tools utilizing comparative genomics and big data analytics, which can be applied to a wide range of microbial research.

Personal Interests: Outside of lab, I enjoy rock-wall climbing and painting.

ARCS Award: I am deeply honored and grateful to receive the ARCS Foundation award. This generous support will significantly alleviate the financial pressures of graduate school, allowing me to dedicate more time and energy to my research. The award not only eases my financial stress but also serves as a profound encouragement, reaffirming the importance of my work and motivating me to strive for excellence in my field.



AVERY PONG

University of California San Diego

Jacobs School of Engineering

Concentration: Bioinformatics

Specialization: Cancer Biology

Donor: Hervey Family Fund

Avery is studying how immune cells communicate with one another in the context of cancer treatment and inflammatory disease progression. He uses computational tools to mine next-generation sequencing data rendered from RNA molecules in tumor cells (for cancer studies) and inflamed fibroblasts (for allergic conditions). This yields information on which cells are producing proteins that could be used to interact with other neighboring cells. At the scale of hundreds of thousands of cells, this research delivers insights into wayward, diseased communication axes that could be targeted by therapeutics to improve patient outcomes.

Degrees: B.S. in Biochemistry, University of Washington.

Awards and Honors: NIH T32 Training Grant in Bioinformatics.

Publications, Papers, and Posters:

Mah, C. K.; Ahmed, N.; Lopez, N.; Lam, D. C.; **Pong, A**.; Monell, A.; Kern, C.; Han, Y.; Prasad, G.; Cesnik, A. J.; Lundberg, E.; Zhu, Q.; Carter, H.; Yeo, G. W. Bento: A Toolkit for Subcellular Analysis of Spatial Transcriptomics Data. *Genome Biol*. 2024, 82. DOI: 10.1186/s13059-024-03217-7.

Pong, A.; Mah, C. K.; Yeo, G. W.; Lewis, N. E. Computational Cell-Cell Interaction Technologies Drive Mechanistic and Biomarker Discovery in the Tumor Microenvironment. *Curr. Opin. Biotechnol*. 2024, 85, 103048. DOI: 10.1016/j.copbio.2023.103048.

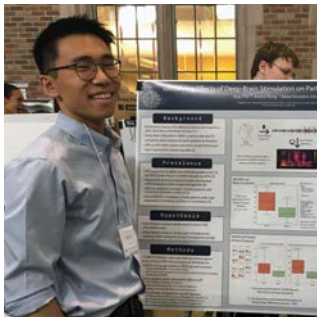
Linsky, T. W.; Vergara, R.; Codina, N.; Nelson, J. W.; Walker, M. J.; Su, W.; Barnes, C. O.; Hsiang, T. Y.; Esser-Nobis, K.; Yu, K.; Reneer, Z. B.; Hou, Y. J.; Priya, T.; Mitsumoto, M.; **Pong, A.;** Lau, U. Y.; Mason, M. L.; Chen, J.; Chen, A.; Berrocal, T.; Peng, H.; Clairmont, N. S.; Castellanos, J.; Lin, Y. R.; Josephson-Day, A.; Baric, R. S.; Fuller, D. H.; Walkey, C. D.; Ross, T. M.; Swanson, R.; Bjorkman, P. J.; Gale, M., Jr.; Blancas-Mejia, L. M.; Yen, H. L.; Silva, D. A. De Novo Design of Potent and Resilient hACE2 Decoys to Neutralize SARS-CoV-2. *Science* 2020, 370 (6521), 1208-1214. DOI: 10.1126/science.abe0075.

Current Research (expanded description): Avery is a former wet-lab immunologist and protein engineer currently working on uncovering social network architectures of immune cells in disease models using single-cell RNA sequencing and spatial transcriptomics. Avery hopes to understand the determinants of intratumoral T-cell infiltration and immune cell organization in inflammatory diseases. He's exploring these interests by employing matched ligand-receptor, co-expression-based cell-cell communication algorithms that can reveal cellular targets prime for therapeutic intervention. He is currently developing computational pipelines to study inter-cellular crosstalk in Eosinophilic Esophagitis models. He's also applying this framework to studying case-control studies of immune checkpoint blockade patients and determining intercellular communication axes that make certain patients susceptible to immunotherapy resistance during prolonged treatment.

Benefits to Science and Society: Avery's research will help to uncover major communication channels within the immune system that can lead to our deeper understanding of each cell type's functional consequences in combatting disease. Moreover, his research may yield novel, disease-relevant protein biomarkers for immunotherapy targeting in the contexts of cancer, autoimmunity, and allergic diseases, all of which that are symptomatically devastating and increasing in prevalence.

Personal Interests: I like to climb, play piano, dance, play ultimate frisbee, and road bike.

ARCS Award: It's an honor to be selected for the ARCS Fellowship among such an amazing cohort of innovative scientists. In the short-term, the award will go a long way to opening up time for my outreach activities outside of lab - like the Biology Undergraduate and Master's Mentorship Program and BISB Outreach Committee at UCSD. I want to be able to instill in others the same interest in science that my education and career opportunities have afforded me. Looking forward, the award will bolster my career as a bioinformatician and scientist.



NATALIE ELAINE QUACH

University of California San Diego

Herbert Wertheim School of Public Health and Human Longevity Science

Concentration: Biostatistics

Specialization: Causal Inference

Donor: ARCS Foundation - San Diego Chapter

Reducing tobacco use remains a significant public health goal. In particular, cigarette smoking is a preventable cause of death and disease in the United States. Natalie's research develops an approach to uncover the mechanisms through which e-cigarette use influences cigarette smoking abstinence. By shedding light on the mechanisms in which e-cigarette use impacts smoking abstinence, Natalie's research strengthens the scientific tools available to researchers and supports the development of strategies to increase smoking cessation and improve public health.

Degrees: B.S. in Applied Mathematics, University of California, San Diego.

Awards and Honors: Biostatistics Diversity in Academic Excellence Award, 2022; Cum Laude Honors, 2022; UC San Diego Physical Sciences Dean's Undergraduate Award for Excellence, 2021.

Publications, Papers, and Posters:

Quach, N.E.; Pierce, J.P.; Chen, J.; Dang, B.; Stone, M.D.; Strong, D.R.; Trinidad, D.R.; McMenamin, S.B.; Messer, K. Daily or non-daily vaping and smoking cessation among US smokers. *JAMA Network Open*. 2025, 8(3), e250089. DOI:https://doi.org/10.1001/jamanetworkopen.2025.0089.

Quach, N.E.; Yang, K.; Chen, R.; Tu, J.; Xu, M.; Tu, X.M.; Zhang, X. Post-hoc Power Analysis: a Conceptually Valid Approach Based on Observed Study Data. *General Psychiatry.* 2022, 35(4), e100764. DOI: 10.1136/gpsych-2022-100764.

Ajmera,V.; Kim B.K.; Yang, K.; Majzoub, A.M.; Nayfeh, T.; Tamaki, N.; Izumi, N.; Nakajima A.; Idilman, R.; Gumussoy, M.; Oz, D.K.; Erden, A.; **Quach, N.E.;** Tu, X.; Zhang, X.; Noureddin, M.; Allen, A.M.; Loomba, R. Liver Stiffness onMagnetic Resonance Elastography and the MEFIB Index and Liver-Related Outcomes in Nonalcoholic

Fatty Liver Disease: a Systematic Review and Meta-Analysis of Individual Participants. *Gastroenterology*. 2022, 163(4), 1079-1089.e5. DOI: 10.1053/j.gastro.2022.06.073.

Davidson, E.J.; Taylor, C.T.; Ayers, C.R.; **Quach, N.E.**; Tu, X.M.; Lee, E.E. The Relationship between Loneliness and Positive Affect in Older Adults*. The American Journal of Geriatric Psychiatry*. 2022, 30(6), 678-685. DOI: 10.1016/j.jagp.2021.11.002.

Current Research (expanded description): Mediation analysis is a valuable method for researchers to understand the mechanisms in which treatments or exposures affect an outcome, such as a measure of a person's health. Matching is a transparent and interpretable approach to reduce bias due to confounding in estimating the causal effect of a treatment on the outcome of interest. Despite methodological advances in mediation analysis, the use of matching in causal mediation analysis remains largely unexplored in the literature. My current research focuses on developing a causal matching mediation method. In particular, I aim to describe how to conduct matching for mediation and demonstrate its unique advantages. This methodological work can help uncover the mechanisms by which e-cigarette use influences smoking cessation among cigarette smokers who use e-cigarettes.

Benefits to Science and Society: Reducing tobacco use remains a significant public health goal. For example, cigarette smoking is a leading preventable cause of death and disease in the United States. My research advances causal mediation methods by introducing matching to uncover the mechanisms through which e-cigarette use influences smoking cessation. This approach provides a transparent, interpretable framework that expands the methodological toolkit for studying complex behavioral processes. Insights from this work can guide interventions and treatments to promote smoking cessation and improve population health.

Personal Interests: I enjoy spending time with family and friends, playing board games, and meditating.

ARCS Award: I am incredibly grateful to receive the ARCS Foundation award. This award means a great deal to me in that it recognizes my efforts and motivates me to continue making a positive impact by using my mathematical and statistical knowledge for public health and biomedical problems. I hope to contribute to my field and inspire others. I look forward to being part of the ARCS community as well as meeting and learning from members in the community.

JARED SIMMONS

University of California San Diego

School of Medicine

Concentration: Biomedical Sciences

Specialization: Dermatology

Donors: Hervey Family Fund

Jared's work in the Gallo Lab focuses on interactions between cell types in the skin and how they control inflammation. He has found that fibroblasts, the major structural cell of the dermis, are far more important to inflammatory response than was previously thought. A better understanding of the unique activity of these cells will provide new targets for developing therapeutics, and it may pave the way to improving outcomes in skin infections and inflammatory skin diseases which affect millions of people.

Degrees: B.S. in Biochemistry, Brigham Young University, Minor in Portuguese.

Awards and Honors: T32 Pre-Doctoral Award for Investigation of Rheumatic Diseases (2024), Society for Investigative Dermatology Eugene M. Farber Travel Award for Young Investigators (2023), BYU Undergraduate Research Awards (2019-2021), BYU College of Physical and Mathematical Sciences Dean's List (2019,2020).

Publications, Papers, and Posters:

Simmons, J.; Gallo, R. L. The Central Roles of Keratinocytes in Coordinating Skin Immunity. *J Invest Dermatol* 2024. DOI: 10.1016/j.jid.2024.06.1280.

Palomo-Irigoyen M, et al. Chronic Skin and Systemic Inflammation Modulated by S100A8 and S100A9 Complexes. *Cell Death Differ* 2025. DOI: 10.1038/s41418-025-01504-9 **(Coauthor).**

Simmons, J.; Cavagnero, K.; Nakatsuji, T.; Gallo, R.L. Fibroblasts are a major cell type in the skin that responds to keratinocyte interleukin-1. *2024 Society for Investigative Dermatology Annual Meeting*. Select E-Poster Discussions (Session 1): *Cell Communications Networks*.

Simmons, J. Cavagnero, K.; Nakatsuji, T.; Gallo, R.L. Dermal Fibroblasts Have a Critical Role in Skin Immunity Through Responses to Keratinocyte Interleukin-1*. 70th Annual Montagna Symposium on the Biology of Skin*. 2023. Session 3: Keratinocyte – Immune Cell Cross-Talk in Skin Inflammation.

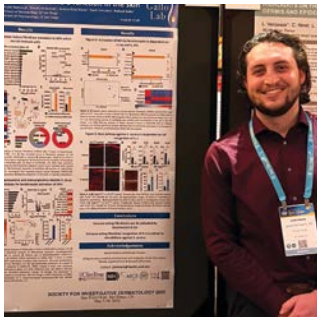
Pace, C. L.; **Simmons, J.**; Kelly, R. T.; Muddiman, D. C. Multimodal Mass Spectrometry Imaging of Rat Brain Using IR-MALDESI and NanoPOTS-LC-MS/MS. *J Proteome Res* 2022, 21 (3), 713-720. DOI: 10.1021/acs.jproteome.1c00641.

Current Research (expanded description): Currently, my goal is to uncover mechanisms by which fibroblasts become immune-active and explore the implications of their role in inflammation. Soon after joining the Gallo Lab, I discovered that cultured dermal fibroblasts express high levels of a CXCL8, a potent neutrophil chemokine, when exposed to keratinocyte conditioned media. Upon further investigation, I found that this response was dependent on availability of the interleukin 1 receptor (IL-1R), and that keratinocytes produce and release its ligands, IL-1α and IL-1β, in response to pathogens. Through various molecular biology techniques, I characterized this fibroblast response. I found that IL-1-activated fibroblasts produce high levels of chemokines which selectively recruit neutrophils, a critical inflammatory immune cell. To study this signaling mechanism in vivo, I developed mice which possess functional IL-1R in all cell types except for fibroblasts. With this mouse model, I demonstrated that inflammatory skin response and immunity is partially dependent on fibroblast recognition of IL-1. Mice that lack fibroblast IL-1R produce less chemokines and are more vulnerable to developing lesions when exposed to pathogenic bacteria. These findings highlight the central role of an overlooked cell type in inflammation and could contribute to the discovery of new therapeutic targets for skin diseases.

Benefits to science and Society: Fibroblasts have been severely overlooked in skin immunology, and my work will help to draw more attention to these diverse and abundant cells. By demonstrating the importance of fibroblasts and deciphering their role in complex inflammatory processes, I hope to contribute to a greater understanding of skin biology. Soon, these and future discoveries may enable more precise drug targeting and improve quality of life for the many people who struggle with skin diseases.

Personal Interests: My husband and I got a puppy this year, and he keeps us very busy!

ARCS Award: Being a part of the ARCS Foundation is a major blessing which I cannot be grateful enough for. Beyond the financial award which will significantly help with the high cost of living in San Diego, I am so excited to get to know members of the local scientific and medical community.



CHESSON SCOTT SIPLING

University of California San Diego

Physical Sciences

Concentration: Physics

Specialization: Physical Approaches to Computation

Donor: Wally Schirra Memorial Endowment Fund

Conventional computers, while ubiquitous in modern society, fail to solve a wide variety of problems efficiently. Chesson's research aims to combat this: he is studying an alternative computing paradigm known as "MemComputing" which relies upon physical principles, rather than algorithms, to excel where traditional approaches have struggled. Such optimization is of paramount importance to avoid the computational bottlenecks being faced in the domains of private industry (passenger aircraft scheduling), public safety (autonomous self-driving vehicles), national security (RSA encryption), and more.

Degrees: B.S. in Physics, Georgia Institute of Technology.

Awards and Honors: Distinguished Junior Graduate Teaching Award 2023, Hitohiro Fukuyo Scholarship 2022.

Publications, Papers, and Posters:

Sipling, C.; Zhang, Y-H.; Di Ventra, M. Memory-induced long-range order in dynamical systems. *Phys. Rev. E.* 2025, 112 (014124). DOI: 10.1103/vwk9-79f7.

Sipling, C. Phase Space Engineering of Digital Memcomputing Machines. Oral presentation. American Physical Society (APS) *Global Physics Summit*, Anaheim, CA. March 2025.

Zhang, Y-H.; **Sipling, C.**; Qiu, E.; Schuller, I. K.; Di Ventra, M. Collective Dynamics and Long-Range Order in Thermal Neuristor Networks. *Nat. Commun.* 2024, 15 (6986). DOI: 10.1038/s41467-024-51254-4.

Sipling, C. Memory-Induced Long-Range Order (LRO) in Dynamical Systems. Oral presentation. *American Physical Society* (APS) March Meeting, Minneapolis, MN. March 2024.

Sun, K-C. J.; **Sipling, C.** Memory-Induced Long-Range Order (LRO) in Neural Activity. Oral presentation. *American Physical Society* (APS) March Meeting, Minneapolis, MN. March 2024.

Current Research (expanded description): Many computational optimization problems fall in the category of NP (nondeterministic polynomial). Although they have easily verifiable solutions, it is thought that these solutions cannot be found in polynomial time via an algorithmic approach (i.e., that P != NP). Instead, a radically new approach is likely required to grapple with such especially challenging problems. One potential approach is "MemComputing", which relies upon memory (time non-locality) to generate long-range order, providing global (topological) information that helps solve the problem. More specifically, it couples the problems' primary degrees of freedom to additional, slow memory degrees of freedom; this separation of time scales produces the long-range order. Furthermore, the memory degrees of freedom "open up" additional directions in phase space so that regions that would be local minima are transformed into saddle points, circumventing a problem frequently encountered by traditional (gradient-descent) techniques. Only the minima which correspond to the problem's logical solutions persist. All of this enables the system to navigate its phase space efficiently and automatically, without the need for any sophisticated algorithms. I hope to use machine learning techniques as well as physical intuition to optimize MemComputing machines even further, making them more efficient and, eventually, commercially viable.

Benefits to Science and Society: In a world that is ever-growing in complexity, fresh computational ideas are needed to keep up with the demands of modern society. I believe that further optimizing MemComputing machines could make a variety of public and private enterprises much more efficient, preventing logistical errors and improving the quality of life of consumers worldwide. Beyond this, a better understanding of memory-induced long-range order, which enables MemComputing machines to operate efficiently, could have applications in a variety of scientific fields.

Personal Interests: I love running (from 5ks to ultramarathons) and backpacking! I also enjoy drumming and performing live with my band.

ARCS Award: It is truly an honor to receive the ARCS Foundation award. Not only does this award alleviate many of my financial burdens, but it also connects me to a network of fellow award recipients, all with their own unique research projects. I look forward to meeting these individuals and sharing ideas. I think this type of cross-pollination between disciplines is critical yet often overlooked in the research industry.

NOAH STAPPER

University of California San Diego/San Diego State University

School of Medicine / College of Sciences

Concentration: Clinical Psychology

Specialization: Suicidality

Donor: ARCS Foundation – San Diego Chapter

Suicide is one of the leading causes of death and 1 in 10 individuals experiences suicidal thoughts in their lifetime. Noah's research focuses on novel treatments for individuals that are experiencing thoughts of suicide. More specifically, he studies brain stimulation techniques, such as transcranial magnetic stimulation, as well as the use of ketamine to reduce suicidal thinking. Although ketamine has shown strong short-term benefits, its effects are often temporary. To address this, Noah studies how combining ketamine with cognitive behavioral therapy might provide longer-lasting relief. To optimize targeted treatments Noah also studies neurophysiological biomarkers of suicidal ideation and treatment response.

Degrees: M.S. in Integrative Neuroscience, University of Edinburgh, Scotland; B.S. in Psychology, University College Utrecht, Netherlands.

Awards and Honors: UCSD Community Impact Award - January 2025; SDSU University Graduate Fellowship (UGF) - August 2023.

Publications, Papers and Posters

Stapper, N.; Kohn, J.; Benster, L.; Daniels, H.; Tello, V.; Patel, A.; Oswal, V.; Stolz, L.; Poorganji, M.; Sun, Y.; Daskalakis, J.Z.; Appelbaum, L.G.; Weissman, C.R. Repetitive Transcranial Magnetic Stimulation for the Treatment of Suicidal Ideation in a Naturalistic Setting. *Brain Stimulation*. 2025 18(1), 141-143.

Benster, L.; Weissman, R.C.; Suprani, F.; Toney, K.; Afshar, H.; **Stapper, N.**; Tello, V.; Stolz, L.; Poorganji, M.; Daskalakis, J.Z.; Appelbaum, L.G.; Kohn, J. Predictive modeling of response to repetitive transcranial magnetic stimulation in treatment-resistant depression. *Translational Psychiatry* (2025).

Fan, J.; Sellers, K.; Khambhati, A.; **Stapper, N.**; Astudillo Maya, D.M.; Kunwar, E.; Henderson, C.; Sugrue, L.; Chang, E.; Rao, V.; Krystal, A.D. Epileptiform discharges triggered with direct electrical stimulation for treatment-resistant depression: Factors that modulate risk and treatment considerations. *Brain Stimulation* (2023).

Stapper, N.; Benster, L.; Menon, S.; Sun, Y.; Appelbaum, L.G.; Daskalakis, Z.J.; Weissman, C.R. Neurophysiological Biomarkers of Treatment Response in Suicidal Ideation: A Systematic *Review. Translational Psychiatry* (In press).

Current Research (expanded description): Suicidal ideation (SI) has a lifetime prevalence of 10% and is a major risk factor for suicide. Despite its significant public health burden, the neurophysiological mechanisms underlying SI remain poorly understood, limiting the development of targeted and durable treatments. Noah's research integrates neurophysiology, neuromodulation, and psychotherapy to address this gap. Using techniques such as transcranial magnetic stimulation combined with electroencephalography (TMS-EEG), Noah investigates neural biomarkers associated with SI severity and treatment response. Identifying such markers has the potential to improve risk stratification, optimize targeted interventions, and inform objective measures of treatment efficacy. Using these biomarkers, Noah optimizes novel therapeutic approaches for SI, including repetitive transcranial magnetic stimulation (rTMS) and intranasal esketamine. While esketamine demonstrates rapid, short-term reductions in suicidal thoughts, the effects remain transient. To enhance durability, his research evaluates the combination of esketamine with mindfulness-based cognitive therapy for a more sustained anti-suicidal effect. Through this integrated approach, Noah aims to establish mechanistic biomarkers of suicidality and optimize treatment strategies, ultimately contributing to more precise, effective, and lasting interventions for individuals at risk of suicide.

Benefits to Science and Society: Individuals experiencing suicidal ideation are an especially vulnerable population, as they often experience severe psychopathology and are at increased risk of suicide. Noah's research aims to offer these individuals effective treatments that have rapid and sustained anti-suicidal effects. These treatments can reduce suffering and decrease suicide rates. Additionally, his research studies neurophysiological biomarkers of suicidal ideation, which can inform treatment predictors, objective psychodiagnostic tools, and suicide risk identification predictors.

Personal Interests: In my free time I enjoy gardening, cooking, and taking a run along the beach.

ARCS Award: I am very honored to receive support from the ARCS Foundation. Suicide research remains both underfunded and understudied, and I hope this fellowship will serve as a springboard for a career dedicated to helping this vulnerable population. I am also grateful to join the ARCS Scholar community and look forward to the opportunity to share knowledge, collaborate across disciplines, and work together toward making a meaningful impact on the world.

LAUREN ALEXANDRIA VALDEZ

University of California San Diego

School of Medicine

Concentration: Neurobiology

Specialization: RNA Biology in Neurodegenerative Diseases

Donor: Hervey Family Fund

Amyotrophic lateral sclerosis (ALS) is a very progressive and fatal age-related disease that manifests as muscle paralysis—due to death of motor neurons—in its early stages. After learning about this disease, Lauren has joined the Chaim lab and focuses on RNA damage and RNA binding protein dysfunction in result of oxidative damage in patients with ALS. For her project, she is attempting to identify where in a neuron this disease begins as science and society are unsure of this answer.

Degrees: B.S. in Neurobiology, University of California, San Diego.

Awards and Honors: National Science Foundation - Graduate Research Fellowship - 2023.

Publications, Papers, and Posters:

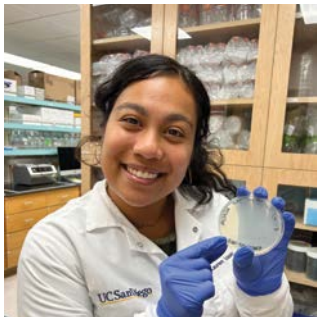
Campbell, P. E.; Abushawish, A. A.; **Valdez, A. L.**; Bell, K. M.; Haryono, M.; Rangamani, P.; Bloodgood, L. B. Electrical signals in the ER: cell-type and stimulus-specific with extreme spatial compartmentalization in neurons. *Cell Reports* 2023, 42 (1). DOI: https://doi.org/10.1016/j.celrep.2022.111943.

Current Research (expanded description): My research is attempting to elucidate any compartmentalization component to neuronal degeneration within amyotrophic lateral sclerosis (ALS). Though there are many factors that can contribute to a neuron's death in a specific location (dendrites, soma, axon, pre-synaptic terminal), I am fixating on the changes to RNA metabolism. Specifically, I am aiming to identify which RNA transcripts in each neuronal compartment are susceptible to oxidation through the high presence of reactive oxygen species (ROS). Following the transcript identity, I am also going to verify that it is properly degraded by RNA binding protein (RBP), Xrn1. Together, I am hoping to classify specific RNA transcripts that are triggering the death of a neuron from specific compartments of a neuron.

Benefits to Science and Society: If my research can identify the point of origin for neuronal death, this will benefit science by narrowing which pathways/molecules/proteins to focus on. Furthermore, this restriction will ease the identification of other susceptible factors contributing to neuronal death in patients with amyotrophic lateral sclerosis (ALS). The benefits to society will be small as this is separate from translational neuroscience, however, with my contribution to science, hopefully this increases the pace of finding a therapy for ALS patients.

Personal Interests: I love all types of arts and crafts activities as well as reading!

ARCS Award: Receiving the ARCS Foundation award is an incredible honor, and it means a great deal to me both personally and professionally. This recognition serves as a validation of my hard work and dedication to advancing neuroscience. The financial support provided by the award allows me to focus on my research, pursue new ideas, and explore innovative approaches that might otherwise have been out of reach. Additionally, being part of the ARCS Foundation community connects me with a network of inspiring scholars and mentors who share my passion for scientific discovery. I am deeply grateful for this opportunity and excited to continue working towards breakthroughs that can benefit society.



BRANDON JAMES VOGT

University of California San Diego

Jacobs School of Engineering

Concentration: Bioengineering

Concentration: Sex Differences/Cardiovascular Disease

Donor: Kurt Benirschke Family

Brandon's research focuses on uncovering the mechanisms underlying sex differences in heart valve disease. By studying both sex-specific and patient-specific drivers of disease progression, he aims to identify optimal drug combinations tailored to individual patients. His work seeks to advance targeted therapies for heart valve disease, improving treatment outcomes across diverse patient populations. Ultimately, his research supports the development of personalized medicine approaches that reduce disparities in care and provide new insights into the heterogeneity of disease progression and treatment responses.

Degrees: B.S. in Biological and Chemical Engineering, University of Colorado Boulder.

Awards and Honors: National Science Foundation Graduate Research Fellow (2022-present), Society for Lab Automation and Screening Student Poster Award (2024), Chancellor's Achievement Scholarship Recipient (2021), Undergraduate Reserach Opportunities Funding Recipient (2021).

Publications, Papers and Posters

Vogt, B. J.; Wang, P.; Chavez, M.; Guo, P.; Chow, E. K. H.; Ho, D.; Aguado, B. A. Determining sex differences in aortic valve myofibroblast responses to drug combinations identified using a digital medicine platform. *Science Advances* 2025, 11 (22), ea u2695. DOI: 10.1126/sciadv.adu2695.

Vogt, B. J.; Peters, D. K.; Anseth, K. S.; Aguado, B. A. Inflammatory serum factors from aortic valve stenosis patients modulate sex differences in valvular myofibroblast activation and osteoblast-like differentiation. *Biomaterials Science* 2022, 10 (22), 6341-6353. DOI: 10.1039/D2BM00844K.

Vogt, B. J.; Aguado, B. A. Precision biomaterials as tools to determine sex-specific mechanisms of cardiovascular disease. *JPhys Materials* 2022, 5 (4), 041002. DOI: 10.1088/2515-7639/ac90ee.

Grim, J. C.; Aguado, B. A.; **Vogt, B. J.**; Batan, D.; Andrichik, C. L.; Schroeder, M. E.; Gonzalez-Rodriguez, A.; Yavitt, F. M.; Weiss, R. M.; Anseth, K. S. Secreted Factors From Proinflammatory Macrophages Promote an Osteoblast-Like Phenotype in Valvular Interstitial Cells. *Arteriosclerosis, Thrombosis, and Vascular Biology* 2020, 40 (11), 2678-2695. DOI: 10.1161/ATVBAHA.120.315261.

Current Research (expanded description): My research focuses on developing targeted therapies for aortic valve stenosis, a progressive heart valve disease with distinct differences between men and women. Currently, no approved drug treatments exist for this disease, in part because they do not account for this biological heterogeneity.

To address this need, I aim to determine how sex chromosomes and circulating serum proteins regulate drug sensitivity in aortic valvular fibroblasts. To do this, I engineered a hydrogel-based cell culture platform that mimics native aortic valve stiffness while still enabling high-throughput testing of anti-fibrotic drugs. Using this system, I generated sex-specific drug response models and identified optimized drug combinations that prevent myofibroblast activation in male or female cells.

Building on this work, I am investigating the role of sex-linked genes, including Y chromosome epigenetic regulators such as UTY, in shaping sex-specific drug responses. I am also analyzing patient serum proteomes to identify circulating factors that predict an individual's response to specific drug treatments.

Together, these studies will advance precision medicine by demonstrating how biological sex and serum composition can guide therapy. Ultimately, my goal is to develop targeted drug strategies that improve treatment outcomes for all patients with aortic valve stenosis.

Benefits to Science and Society: My research seeks to advance our understanding of the mechanisms underlying sex differences in heart disease. I focus on clarifying how sex chromosomes and serum proteins contribute to heterogeneity in disease development, progression, and treatment response. Building on these insights, I aim to leverage mechanistic differences to optimize drug combination efficacy across patient populations. Ultimately, my work strives to reduce inequities in heart valve disease outcomes and promote a more personalized approach to treatment.

Personal Interests: My interests outside of research include going to the movie theater, rock climbing, and running.

ARCS Award: Receiving the ARCS Foundation award is a great honor and a meaningful milestone in my career. Professionally, this support will provide the resources and flexibility to deepen and expand my research on cardiovascular disease, particularly in addressing sex differences that contribute to inequities in treatment outcomes. With this award, I will be able to dedicate more time to advancing projects that could directly improve patient care. It also allows me to engage more fully with the scientific community by attending conferences, workshops, and industry events. This will help me to foster collaborations and gain exposure to cutting-edge ideas that can inform and enhance my work.

On a personal level, the award offers financial freedom that alleviates some of the pressures associated with pursuing a PhD. It allows me to focus entirely on achieving my research goals, investing in my professional growth,and cultivating skills that will have a long-term impact in science. Beyond the financial support, the ARCS Foundation award represents recognition of my work and validation that my research can make a meaningful difference in advancing health equity.

OLIVIA JADE WENG

University of California San Diego

Jacobs School of Engineering

Concentration: Computer Science and Engineering

Specialization: Hardware-software Codesign

Donor: Donald C. and Elizabeth M. Dickenson Foundation

Olivia conducts research on designing hardware with the software in mind and vice versa to make computing devices more efficient and resilient. This benefits science and society because high-energy physicists require cutting-edge computing technology to complete their experiments, like at the CERN Large Hadron Collider. In collaboration with CERN physicists, I build neural network software and hardware that meets their computing needs so that they can discover new physics.

Degrees: M.S. in Computer Science and Engineering, University of California, San Diego; B.S. in Computer Science, The University of Chicago.

Awards and Honors: CSE Doctoral Award for Excellence in Service and Leadership, 2025; MICS-Qualcomm Hypatia Dissertation Fellowship, 2024; National Science Foundation Graduate Research Fellowship, 2022.

Publications, Presentations, and Posters:

Weng, O.; Andronic, M.; Zuberi, D.; Chen, J.; Geniesse, C.; Constantinides, G. A.; Tran, N.; Fraser, N. J.; Duarte, J. M.; Kastner, R. Greater than the Sum of Its LUTs: Scaling up LUT-Based Neural Networks with AmigoLUT. *Proceedings of the 2025 ACM/SIGDA International Symposium on Field Programmable Gate Arrays*. 2025. https://doi.org/10.1145/3706628.3708874

Weng, O.; Meza, A.; Bock, Q.; Hawks, B.; Campos, J.; Tran, N.; Javier Mauricio Duarte; Kastner, R. FKeras: A Sensitivity Analysis Tool for Edge Neural Networks. *ACM Journal on Autonomous Transportation Systems* 2024, 1 (3), 1–27. https://doi.org/10.1145/3665334.

Weng, O.; Marcano, G.; Lončar, V.; Khodamoradi, A.; Abarajithan, G.; Sheybani, N.; Meza, A.; Koushanfar, F.; Denolf, K.; Duarte, J.; Kastner, R. Tailor: Altering Skip Connections for Resource-Efficient Inference. *ACM Transactions on Reconfigurable Technology and Systems*. 2023. https://doi.org/10.1145/3624990

Drewes, C.; **Weng, O.**; Ryan, K.; Hunter, B.; McCarty, C.; Kastner, R.; Richmond, D. Turn On, Tune In, Listen Up: Maximizing Side-Channel Recovery in Time-To-Digital Converters. *Proceedings of the 2023 ACM/SIGDA International Symposium on Field Programmable Gate Arrays. 2023*. https://doi.org/10.1145/3543622.3573193

Current Research (expanded description): My research lies at the intersection of artificial intelligence and embedded systems. I am particularly interested in using hardware-software codesign to develop efficient, fault-tolerant computer architectures for neural networks (NNs). Scientific applications are increasingly using NNs at the edge, as they outperform traditional algorithms in fields like high-energy physics and materials science. For example, the CERN Large Hadron Collider (LHC) Compact Muon Solenoid project is upgrading to run particle collision experiments that will generate data rates of 100 TB/s, a rate that would fill all of Google's servers in a matter of days. To meet these demands, edge NNs must be heavily quantized (i.e., parameter representation using lower precision data types) and executed fully on chip. Additionally, edge NNs can be deployed in harsh environments like the LHC (1000× the radiation in space), presenting challenges for designing NNs and their hardware to be robust to faults. My research is motivated by the computing challenges that scientists in other fields face in their own research. My work takes a hardware-software codesign approach for developing efficient NNs and evaluating NN robustness, especially for edge NNs targeting specialized hardware architectures.

Benefits to Science and Society: My research makes computing devices more efficient and resilient, making it easier to deploy them at the CERN Large Hadron Collider or in space.

Personal Interests: I regularly attend the theater.

ARCS Award: I am very honored to receive the ARCS Foundation award. It means a lot to me that my research is recognized in this way at such an early stage my career. It encourages me to continue to pursue my ambitions.


University
of San Diego

BASMA ADAMS

University of San Diego

Hahn School of Nursing and Health Science

Concentration: Nursing

Specialization: Diabetes

Donor: Laurie and Michael Roeder / ARCS Foundation - San Diego Chapter

Basma studies how diabetes medical technology, especially insulin pump therapy, affects long-term diabetes management. She explores not only the technology itself but also how psychological factors like burnout, confidence, and emotional well-being influence how people use these devices every day. By examining both the medical and human sides of diabetes care, her research aims to improve treatment outcomes and help individuals manage their condition more effectively over time. She aims to improve daily life for people with diabetes through her research to shape more personalized, effective treatment strategies that go beyond medicine to support long-term health and well-being.

Degrees: B.S. in Psychology, University of California, San Diego, 2015; M.S. in Nursing, University of San Diego, 2022.

Awards and Honors: Dean's List, 2025; ARCS Foundation Scholar Award, 2025; The DiabetesMine Innovation Summit Patient Voices Delegate, 2024.

Benefits to Science and Society: My research aims to improve diabetes outcomes by exploring how insulin pump therapy, combined with psychosocial factors like confidence and self-efficacy, impacts disease management. By identifying key behavioral and emotional drivers of successful technology use, this work can inform more personalized, effective treatment approaches. Ultimately, it contributes to advancing patient-centered care, reducing complications, and improving quality of life for millions living with diabetes—bridging the gap between medical devices and meaningful daily health outcomes.

Personal Interests: I enjoy writing, reading, and spending time with my friends, family, and my two affectionate cats.

ARCS Award: Receiving the ARCS Foundation award is both an honor and a profound encouragement. It affirms the value of my research and dedication, and connects me to a community that truly believes in the transformative power of science and innovation. My work focuses on the intersection of insulin pump therapy and psychosocial factors like confidence and self-management. This support not only helps alleviate financial stress but also reinforces the importance of human-centered innovation in medical technology. I'm deeply grateful to be part of a community that champions scientific progress with real-world impact.

SANDY JEAN JELLEN

University of San Diego

Hahn School of Nursing and Health Science

Concentration: Nursing

Specialization: Oncology

Donor: Beyster Family Foundation

There is a high incidence of women who have experienced a form of physical sexual violence. Patients who have experienced sexual trauma are particularly vulnerable because they can become anxious and retraumatized during their medical experience. Sandy's focus is on improving the screening process for identifying patients with a sexual trauma history in order to provide trauma-informed care. Her research will also study the relationships among sexual trauma (yes/no), resilience, help-seeking experiences, and copying within the adult gynecologic oncology population.

Degrees: M.S. in Nursing- Clinical Nurse Specialist, Point Loma Nazarene University; A.D. in Nursing, Maric College; B.S. in Behavioral Science, Chaminade University of Honolulu.

Awards and Honors: University of San Diego, Dean's Merit Scholarship, 2023, 2024; San Diego Oncology Nursing Society Gracia Award, 2023; UCSD Overall Ambulatory Nurse of the Year, 2022; UCSD Ambulatory Nurse of the Year- Exemplary Professional Practice, 2022.

Publications, Papers, and Posters:

Jellen, S.; Williams, J.; Kane, S.; Increasing Nurses' Knowledge and Confidence in Ambulatory Oncology Processes and Documentation Standards: Supporting the Success of QOPI Recertification. Poster. *50th Annual Oncology Nursing Society Congress.* Denver, CO, April 2025.

Jellen, S.; Lacatus, G.; Kane, S.; Anguiano, H. Utilization of the PHQ-2 Tool to Increase Nurse Screening Compliance and Improve Depression Screening for Oncology Patients. Poster. *49th Annual Oncology Nursing Society Congress*. Washington, D.C., April 2024.

Jellen, S. Implementation of an Onboarding Model in an Outpatient Oncology Infusion Center: Increasing Nurse Satisfaction, Knowledge, and Confidence. Poster. *48th Annual Oncology Nursing Society Congress.* San Antonio, TX, April 2023.

Jellen, S.; Lacatus, G. Nurse Liaison: Bridging the Gap in the Care Continuum for Ambulatory Infusion Patients. Poster. 47th *Annual Oncology Nursing Society Congress*. Anaheim, CA, April 2022.

Current Research (expanded description): Gynecologic oncology patients with a sexual trauma history may experience depression, anxiety, and post-traumatic stress disorder which can create feelings of discomfort during routine vaginal procedures. Patients may also experience a sensation comparable to what they experienced during the assault. Screening for a history of sexual abuse not only helps uncover a history of abuse, but also allows for the appropriate referrals and care, which can help decrease the distress experienced during treatment and exams. The purpose of my study is to describe the difference in sexual trauma screening between the Two-Question Screening Tool and the Abuse Assessment Screen (AAS) among gynecologic oncology patients and explore the relationships among sexual trauma history, resilience, help-seeking experiences, and coping.

Using data from an ambulatory cancer center in an academic healthcare system where AAS has previously been implemented, this comparison study seeks to answer whether the use of the two-question screening tool captures a higher incidence of sexual trauma history among gynecologic oncology patients. By analyzing the relationship between the Two-Question Screening Tool and the AAS, healthcare providers can refer patients with a positive sexual trauma history to social work services and deliver trauma informed care.

Benefits to Society and Science: An expected benefit of my proposed research is early identification of sexual trauma history which can lead to appropriate referrals to support services. Awareness of a patient's trauma history also enables healthcare providers to provide trauma-informed care which can reduce the risks of re-traumatization from the invasive procedures experienced in the gynecologic oncology setting. Furthermore, data from sexual trauma screenings can lead to public health awareness and prevention efforts leading to the creation of better support systems for survivors.

Personal Interests: I enjoy traveling with my family, exploring different cultures, local cuisine, and visiting all the Disney parks around the world.

ARCS Award: I am honored to be selected as an ARCS Foundation recipient and become a part of this wonderful community of scientists. Receiving this scholarship has given me another avenue of spreading knowledge that I am passionate about and allows me to create a positive impact in the patient's healthcare experience. I am thankful to all of the donors for their generosity in advancing my educational goals and paving the way for a career in science.

KRISTINA MARIA LOPEZ

University of San Diego

Hahn School of Nursing and Health Science

Concentration: Nursing

Specialization: Perianesthesia Nursing

Donor: Beyster Family Foundation

The use of minimally invasive technologies like robotics continues to increase in surgical specialties. Patients undergoing robotic surgery may be discharged home directly from the recovery room. Kristina's research will explore potential relationships between patient comorbidities, anesthetic agents, and same-day discharge rates in robotic gynecologic surgery patients to improve quality care, prevent postoperative complications, and reduce unexpected overnight admissions.

Degrees: MSN Ed. in Nursing, Grand Canyon University; BSN in Nursing, South University; ADN in Nursing, Grossmont College.

Awards and Honors: Doris A. Howell Foundation Award 2025; Irene S. Palmer Research Award 2025; Caster Institute for Nursing Excellence Education Scholarship 2025; University of San Diego, Dean's Merit Scholarship Award 2024-2025.

Publications, Papers, and Posters:

Lopez, K. Enhanced Recovery After Surgery: A Concept Analysis from the Healthcare Worker Perspective. *Presented at the SHC Interprofessional Research & Innovation Conference*, San Diego, CA, September 27, 2024; poster.

Lopez, K.; Ryan, C. Ambulatory Patient Discharge Education Standardization of Nursing Workflow & Education Tool. *Presented at the ANCC National Magnet Conference*, Atlanta, GA, November 11-13, 2021; poster.

Current Research (expanded description): Perioperative services include preoperative, intraoperative, and postoperative care, which is a fast-paced environment. Patients transition from the operating room to the post-anesthesia care unit (PACU) and have different recovery needs. Patients undergoing gynecologic robotic surgery require specific intraoperative positioning, anesthetic agents, and recovery plans. One aim of my research is to explore potential relationships between patient demographics, patient comorbidities, anesthetic agents, duration of surgery, and same-day discharge in the robotic gynecologic surgery patient. A second aim is to identify the likelihood of patient same-day discharge accounted for by the previously mentioned predictor variables. This research seeks to improve patient outcomes and perioperative care for women undergoing robotic gynecologic surgery in Southern California.

Benefits to Society and Science: Currently, a standardized anesthesia protocol for gynecologic robotic surgery does not exist in the hospital where I work. Identifying relationships between patient comorbidities, specific anesthetic agents and the ability for patients to discharge home the same-day of surgery can lead to the development of a standardized anesthesia protocol for the gynecologic robotic surgery patient. Desired outcomes include optimizing recovery through the reduction of complications in the recovery room, early patient mobilization, reduced opioid use, and early feeding, resulting in the ability of patients to discharge home.

Personal Interests: In my downtime, I enjoy hiking, walks on the beach, Jeeping, and being out in nature.

ARCS Award: It is an honor to be the recipient of an ARCS Foundation award. This support assists me in continuing my research journey in perianesthesia nursing and initiating practice change to improve quality patient care.

JESSICA LEE RITCHIE

University of San Diego

Hahn School of Nursing and Health Science

Concentration: Nursing

Specialization: Critical Care

Donor: Beyster Family Foundation

Over 20 million patients receive treatment in intensive care units (ICUs) each year in the United States. Many of these patients are unable to participate in care decisions and rely on family members or other appointed surrogates to advocate on their behalf. Deficiencies in collaborative decision-making between surrogates and the clinical team result in negative mental and physical outcomes for both the patient and surrogate. Jessica's research will focus on understanding ICU surrogate experiences of shared decision-making during episodes of acute clinical deterioration within adult ICUs.

Degrees: M.S. in Nursing, University of San Diego; B.S. in Cognitive Science/Neuroscience, University of California at San Diego

Awards and Honors: : Hahn School of Nursing Dean's Graduate Scholar, 2025; Hahn School of Nursing Dean's Merit Scholar, 2024-2025; Scripps Martin Luther King Junior Scholar, 2024-2025.

Publications, Papers, and Posters:

Boyd, M.; **Ritchie, J.**; Collaborative Strategies to Advance Nursing Certification: Driving Professional Growth and Patient Excellence. Abstract accepted for presentation at the *National Association of Clinical Nurse Specialists,* San Diego, CA, March 9-12, 2026.

Couts, L.; Libby, K.; Nalick, C.; Kalafut, M.; Calara, R.; **Ritchie, J.**; Sanchez, S.; Parallel Processing: Aligning In-Hospital Stroke Code with ED Direct Arrival to Improve Time to Treatment Decisions. Abstract accepted for presentation at the *National Teaching Institute and Critical Care Exposition,* San Diego, CA, May 18-20, 2026.

Patel, S.; **Ritchie, J.**; Implementation of a Nurse-driven Rounding Checklist to Decrease Length of Stay and Improve Plan of Care in Medical Trauma Stepdown Patients. Presented at the *Evidence-Based Practice Institute Consortium Conference*, San Diego, CA, November 14, 2023.

Ritchie, J.; Boone, S.; Amezquita, A.; Addressing Barriers to CAM-ICU Delirium Screening Among ICU Nurses. Poster Presented at the *University of San Diego Graduate Research Symposium*, May 5, 2011.

Current Research (expanded description): In recent years, life-saving interventions in critical care medicine have advanced steadily. An array of complex therapies can extend life, though not necessarily quality of life congruent with the individual patient's values and preferences. One prominent example is the rise in use extracorporeal membrane oxygenation (ECMO), in which a mechanical circuit functions as the patient's lungs and/or heart. With such advancements come a widening gap in health literacy between clinician teams and non-clinical ICU surrogate decision makers. My research is a descriptive qualitative study examining the lived experiences of ICU surrogates involved in decisions related to acute periods of clinical deterioration, such as cardiac arrest, hemorrhage, pulmonary embolism, stroke, and myocardial infarction. My study will examine the relationships between select ICU surrogate socio-demographics, types of patient clinical deterioration, and perceived levels of shared decision-making.

Benefits to Science and Society: The Society for Critical Care Medicine (SCCM) endorses family involvement in the care of ICU patients. In their latest 2024 guidelines, however, the SCCM was unable to support the use of shared decision-making tools, such as artificial intelligence-leveraged and other patient educational aids, citing paucity of research within the adult ICU population (Hwang & Hopkins, 2025). In my research, I hope to illuminate the current state of SDM and thus drive improvements in patient, surrogate, and health systems outcomes.

Personal Interests: Outside of work and study, I enjoy traveling and spending time outdoors with my husband and young daughter.

ARCS Award: The ARCS Foundation's financial support will allow me to focus on my research efforts rather than funding. The award also provides a platform for networking with and learning from other local interdisciplinary researchers. Thank you for this opportunity!

ARCS ADVANCING SCIENCE IN AMERICA®
SAN DIEGO CHAPTER

ARCS Foundation is a national nonprofit organization administered entirely by women.
san-diego.arcsfoundation.org