ARCS ADVANCING SCIENCE IN AMERICA®

SAN DIEGO CHAPTER

ACHIEVEMENT REWARDS FOR COLLEGE SCIENTISTS

SCHOLARS' PROFILES

2020-2021

2020-2021 SCHOLARS

SAN DIEGO CHAPTER

The San Diego chapter of ARCS began in 1985 and has grown from the original four founders to more than 100 members today. As we continue to celebrate our 35th anniversary, we have made more than 1400 awards totaling well over $10 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 and have at least a 3.5 GPA; they must be enrolled in academic degree programs in science, engineering, and medical research. Awards are unrestricted and merit-based. The San Diego chapter focuses on supporting students in doctoral programs, and the ARCS Scholars we have funded have a 98% graduation rate, compared with the national rate of 60% for graduate students in the sciences and engineering. Annual awards to Scholars range from $5,000 to $10,000.* For the 2020-2021 academic year, the San Diego ARCS chapter has awarded $420,000 to 46 Scholars.

*In June 2020, the ARCS-San Diego Board voted to increase the full Scholar Award amount from $7,500 to $10,000 (Awards for Scripps Research remain at $5,000 in accord with their request). For the academic year 2020-2021, any full award donation received at the $7,500 level is still considered a full award and was augmented by ARCS-San Diego to fund the Scholars at the new award level of $10,000.

SUMMARY

ARCS Foundation - San Diego Chapter 2020-2021 Scholars

All ARCS Scholars supported by the San Diego Chapter are enrolled in doctoral programs

Navigate document by clicking on the Scholar name or click to the section by clicking on an institution.

SAN DIEGO STATE UNIVERSITY

Amanda Therese Alker – Cell and Molecular Biology
Theresa Leigh Ute Burnham – Ecology
Mariel Manaloto Cardenas - Chemistry
Molly Elizabeth Clemens - Ecology
Roslynn Beatrice King – Geophysics
Lucas Aaron Luna - Biochemistry
Tiffany Luong – Cell and Molecular Biology
Kyle Evan Malter – Biological Sciences
Amelia Odine Stone-Johnstone - Mathematics Education
Nicholas Benjamin Williams - Chemistry

SCRIPPS RESEARCH

Lisa Marie Barton - Chemistry
Nathalia Romanio Gazaniga – Biomedical Sciences
Tucker Ryan Huffman - Chemistry
Anthony Nicholas Milin - Biomedical Sciences
Sophia Louise Shevick - Chemistry
Mia Shin - Biomedical Sciences
Nelson Ren Wu – Immunology
Leonard Heekyu Yoon - Chemical Biology

UNIVERSITY OF CALIFORNIA SAN DIEGO

Bryce Eric Ackermann - Biochemistry
Miriam Kathleen Bell - Mechanical Engineering
Laura Brown Chipman - Biological Sciences
Gabrielle Marie Colvert - Bioengineering
Bethanny Patricia Danskin - Neurosciences
Mickey Finn III - NanoEngineering
Mark Kalaj - Chemistry
Kevin Richard Kaufmann - NanoEngineering
Andrew Thomas Kleinschmidt - Chemical Engineering
Jenna Joaquin Lawrence - Mechanical and Aerospace Engineering
Chi-Wei Man - Biochemistry
Ryan Jared Marina - Biomedical Sciences
Nicole Patricia Mlynaryk - Neurosciences
Colman Arthur Moore - NanoEngineering
Jessica Yi-Jun Ng - Geochemistry
Victor Wingtai Or - Analytical and Atmospheric Chemistry
Jason Alexander Platt - Biophysics
Channing Joseph Prend - Physical Oceanography
Dimitrious Adrian Schreiber - Electrical Engineering
Samantha Lylah Sison - Cell and Molecular Biology
Matthew David Stone - Public Health - Health Behavior
Anthony Quoc Vu - Biomedical Sciences
Alexander Jeffrey Whitehead - Bioengineering
Jiarong Zhou - NanoEngineering

UNIVERSITY OF SAN DIEGO

Byron Batz - Nursing
Pedro Alonso Colio- Nursing
Ann Ozaze Lawani - Nursing
Brooke Haley Rakes - Nursing

San Diego State University

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

AMANDA THERESE ALKER

San Diego State University / University of California San Diego

College of Sciences

Concentration: Cell and Molecular Biology

Specialization: Environmental Microbiology

Donor: Reuben H. Fleet Foundation Fund

Many bottom-dwelling marine animals, like corals and tubeworms, release their babies into the water column, where they swim in search of an environmental cue that indicates a suitable place to settle onto the seafloor and develop. Certain bacteria coating submerged surfaces can serve as this environmental cue. Amanda's research investigates a single probiotic marine bacterium and demonstrates that it can produce multiple different cues that influence the babies to settle down. Harnessing these bacteria as "environmental probiotics" may allow scientists to restore threatened ecosystems (like coral reefs) in the future.

Degree: B.A. in Biology, Harriet L. Wilkes Honors College at Florida Atlantic University

Awards and Honors: ARCS Foundation, Inc. – San Diego Scholar 2020-2021; International Coral Reef Society Student Travel Award, May 2020; National Science Foundation - Graduate Research Internship Award, January 2020; NSF - Graduate Research Fellowship 2017-2022

Publications, Papers, and Posters:

Alker, A.T.; Delherbe, N.; Purdy, T.N.; Moore, B.S.; Shikuma, N.J. Genetic examination of the marine bacterium Pseudoalteromonas luteoviolacea and effects of its metamorphosis-inducing factors. Environmental Microbiology, August 2020. [https://doi.org/10.1111/1462-2920.15211]

Cavalcanti, G.S.; **Alker, A.T.**; Delherbe, N.; Malter, K.; Shikuma, N.J. The influence of bacteria on animal metamorphosis. Annual Reviews of Microbiology, 2020, 74:1, 137-158. [DOI: 10.1146/annurev-micro-011320-012753]

Rojas,* M.I.; Cavalcanti,* G.S.; McNair, K.; Benler, S.; **Alker, A.T.**; Cobián-Güemes, A.G.; Giluso, M.; Levi, K.; Rohwer, F.L.; Bailey, B.A.; Beyhan, S.; Edwards, R.A.; Shikuma, N.J. A distinct contractile injection system found in a majority of adult human microbiomes. mSystems, 2020, 5 (4) e00648-20. [https://doi.org/10.1128/MSYSTEMS.00648-20]

Alker, A.T.; Delherbe, N.; Purdy, T.N.; Little, M; Rohwer, F.L.; Wegley-Kelly, L.; Moore, B.S.; Shikuma, N.J. A marine bacterium produces three distinct factors that stimulate animal metamorphosis. Ocean Sciences Meeting. 18 Feb 2020. San Diego, CA

Current Research (expanded description): My doctoral research has identified that a single beneficial marine bacterium, Pseudoalteromonas luteoviolacea, is capable of producing two previously described metamorphosis-inducing cues. One is a halogenated chemical called tetrabromopyrrole that can induce coral metamorphosis. The other is a proteinaceous complex called Metamorphosis-Associated Contractile structures that facilitates tubeworm metamorphosis. Using a combination of approaches including comparative genomics, bacterial genetics, and biochemistry, my research is the first to directly compare the effects of both cues on different model animals in the laboratory. We edited the bacterial genome and generated mutant strains lacking genes necessary to produce the chemical and protein cues independently. We then exposed larvae of model organisms (tubeworms and hydra) to the manipulated bacteria in metamorphosis assays and counted the number of larvae that metamorphosed in response to each bacterial treatment. Interestingly, a previous study found that P. luteoviolacea is capable of inducing coral metamorphosis, but neither the chemical nor the protein structure identified previously was offered as an explanation for this phenomenon. We have constructed a library of tetrabromopyrrole mutant bacteria that will be used to probe the effect of the mutant strains of bacteria on coral larvae.

Benefits to Science and Society: Amanda's research develops the potential of the marine bacterium Pseudoalteromonas luteoviolacea as a tool for understanding the underlying cellular mechanisms that influence metamorphosis in diverse animals. Harnessing settlement-inducing bacteria and their specific cues could pave the way for the production of coral settlement products and could be used in aquaculture to increase settlement efficacy. Furthermore, understanding the specific cues that facilitate metamorphosis in diverse animals can help us understand how to control biofouling on the hulls of ships.

Personal Interests: Academic: Mentoring students and enhancing scientific communication | Personal: Live music - the funkier the better; surfing; backcountry camping; SCUBA

ARCS Award: To me, the ARCS Foundation award signifies recognition of both my accomplishments and my potential in academia. I am particularly honored to be recognized by the ARCS Foundation because of its history with female leadership. I wouldn't be where I am today without the support of strong independent women, which makes the support from the ARCS Foundation even more impactful to me. Furthermore, I appreciate the financial support and the investment in my future because they allow me to continue my doctoral research and reach for higher impact projects. The supplementary funds make my salary more sustainable as a graduate student with real-world financial responsibilities.

THERESA LEIGH UTE BURNHAM

San Diego State University / University of California Davis

College of Sciences

Concentration: Ecology

Specialization: Marine Fisheries Ecology and Management

Donor: Reuben H. Fleet Foundation Fund

Around the world, marine fisheries are threatened by increasing demand for seafood and warming oceans. Theresa's research focuses on improving management of the lucrative, but vulnerable, spiny lobster fishery in Southern California and Mexico. By gathering fishing data, biological characteristics, and genetic signatures from lobsters along the Pacific coast, Theresa aims to create modern, climate-ready solutions for the environmental problems faced by small-scale fisheries and the coastal communities that rely on them.

Degree: B.S. in Biology, Northeastern University

Awards and Honors: : Ecological Society of America Policy Section Registration Grant 2020; University of California UC MEXUS Small Grant Award 2018-2019; University Graduate Fellowship, San Diego State University 2017-2019; National Oceanic and Atmospheric Administration Holling's Scholar 2013-2015

Publications, Papers, and Posters:

Burnham, T.L.U.; Dunn, R.P.; O'Rourke, S.; Miller, M.; Hovel, K.A. Implications of spatially variable demography and fishing behavior of a binational fishery. 6th Annual International Marine Conservation Congress. 18 August 2020, Virtual

Knight, C.J.; **Burnham, T.L.U.**; Mansfield, E.J.; Crowder, L.B.; Micheli, F. COVID-19 reveals vulnerability of small-scale fisheries to global market systems. Lancet Planet. Health. 2020; 4:e219

Burnham, T.L.U.; Miller, M.; O'Rourke, S.; Hovel, K.A. Clarifying population structure of the California spiny lobster (Panulirus interruptus). 100th Annual Western Society of Naturalists Meeting. 3 November 2019, Ensenada, Baja California, Mexico

Saley, A.M.; Smart, A.C.; Bezerra, **M.F.; Burnham, T.L.U.**; Capece, L.R.; Lima, L.F.O.; Carsh, A.C.; Williams, S.L.; Morgan, S.G. Microplastic accumulation and biomagnification in a coastal marine reserve situated in a sparsely populated area. Mar. Pollut. Bull. 2019; 146:54-59

Current Research (expanded description): Motivated by a deep appreciation for the inherent value of our oceans and coastal community members, my research aims to enhance the sustainability of the California spiny lobster fishery in the face of global change. My dissertation work is focused on three components of the fishery: (1) management, (2) population structure, and (3) impacts of climate change. To address the management aspect, I am developing a predictive simulation model that compares the effectiveness of different management procedures in various scenarios (e.g. future climate states). I am working with California Department of Fish & Wildlife to create a model that can be implemented directly into management. For my second chapter, I am using next-generation sequencing techniques to determine the genetic signatures of lobsters over 800 miles of their range. Identifying genetic differences between subpopulations may help managers develop more effective, spatially-explicit conservation methods. Finally, I am analyzing the relationship between the lobster fishery and increasingly frequent marine heat waves to understand how climate change may impact California's fifth most valuable marine fishery. This component will be useful to fishers as they plan future fishing seasons under new climate norms.

Benefits to Science and Society: My research will enhance our understanding of the biology and ecology of the valuable California spiny lobster, promoting the creation of more effective management strategies. This outcome can benefit fishers and coastal communities that depend on this species for livelihood and recreation. This is important as fisheries face increasing threats due to warming oceans and overexploitation. My findings will also be applicable to other marine fisheries species that occur across national boundaries and experience different environmental conditions throughout their range.

Personal Interests: I spend my free time hiking and biking in nature, cooking and baking at home, or volunteering for political campaigns.

ARCS Award: The ARCS Foundation award is meaningful to me in many ways, chiefly in celebrating my research goals and accomplishments. Outside validation is extremely rewarding, and being welcomed into the ARCS community provides a new network of hard-working scientists to collaborate with and entrepreneurial women that I admire. Further, the financial component of the award helps ease the stress and inflexibility that come with pursuing a doctoral degree while living in poverty. The ARCS Foundation award will provide valuable flexibility as I advance in my career and aid me in reaching my full potential as a professional scientist.

MARIEL MANALOTO CARDENAS

San Diego State University / University of California San Diego

College of Sciences

Concentration: Chemistry

Specialization: Asymmetric Catalysis in Medicinal Chemistry, Organic Chemistry

Donor: ARCS Foundation - San Diego Chapter / Robin Luby

Obtaining 'large-scale,' industry-standard quantities of enantiomerically pure (i.e. the correct conformational and stereochemical structure of) drug scaffolds represents a major challenge in drug discovery, as the traditional state of industry currently lacks time and cost-efficient processes. This is likely due to the current lack of catalytic, synthetic, and asymmetric methodologies amenable with medicinal chemistry efforts. Mariel started conducting graduate-level research under Dr. Jeffrey L. Gustafson at SDSU. She has since developed some of the desirable, general strategies to access pharmaceutically-relevant scaffolds.

Degrees: B.S. in Chemistry, University of California San Diego; A.S. in Pre-engineering, San Diego Miramar College; A.A. in Mathematical Studies, San Diego Miramar College

Awards and Honors: University Graduate Fellowship, SDSU, May 2019-present; ARCS Scholar, Aug 2017-present; NIH Funded Student, Aug 2017-present; Cal Vet Funded Student, Aug 2015-Aug 2020

Publications, Papers, and Posters:

Cardenas, M.M.; Saputra, M.A.; Sanchez, A.N.; Robinson, C.J.; Valle, E.; Gustafson, J.L. Accessing pharmaceutically relevant 3-arylated N-heterocycles via atroposelective synthetic methodologies. American Chemical Society National Meeting & Exposition, Fall 2019. 26 August 2019, 29 August 2019, San Diego Convention Center, San Diego, CA

Cardenas, M.M.; Saputra, M.A.; Sanchez, A.N.; Robinson, C.J.; Valle, E.; Gustafson, J.L. Development of atroposelective syntheses of pharmaceutically relevant N-heterocycles. 46th National Organic Chemistry Symposium. 26 June 2019, Indiana University, Bloomington, IN

Cardenas, M.M.; Saputra, M.A.; Sanchez, A.N.; Robinson, C.J. Valle, E.; Gustafson, J.L. Developing atroposelective syntheses to access diverse pharmaceutically relevant scaffolds. American Chemical Society National Meeting & Exposition, Spring 2019. 1 April 2019, 3 April 2019, Orange County Convention Center, Orlando, FL

Cardenas, M.M.; Toenjes, S.T.; Nalbandian, C.J; Gustafson, J.L. Enantioselective synthesis of pyrrolopyrimidine scaffolds through cation-directed nucleophilic aromatic substitution. Org. Lett. 2018, 20, 2037-2041. [doi: 10.1021/acs.orglett.8b00579] [PMID: 29561161, PMC5909700]

Current Research (expanded description): There is renewed interest in leveraging atropisomerism to synthesize more potent and selective N-heterocyclic pharmaceuticals. One unaddressed challenge is the narrow window of synthetic methodologies to directly access these important atropisomeric scaffolds on desired "gram-scale" quantities. Mariel and her coworkers in the Gustafson group at SDSU have reported an atroposelective nucleophilic aromatic substitution towards a diverse range of these aforementioned compounds in high enantioselectivities and optimal yields. Mariel selected thiophenols to add into these pharmaceutically relevant N-heterocycles since the resulting product is synthetically and medicinally useful in drug discovery. Examples of N-heterocycles we have directly functionalized with this chemistry include 3-aryl pyrrolopyrimidines (PPYs, a well-studied kinase inhibiting scaffold) and 3-aryl quinolines (which are ubiquitous in many drug and 'drug'-like compounds). Currently, Mariel and her colleagues are developing other nucleophilic reactions such as asymmetric Minisci-type chemistries, vicarious nucleophilic substitutions, and enantioselective cyclizations.

Benefits to Science and Society: Atropiomerism (also referred to as axial chirality) is ubiquitous in all of drug discovery, as 30% of FDA approved drugs since 2011 possess at least one interconverting axis of atropisomerism. While this number is striking, the current 'industry standard' is to avoid creating stable atropisomers when possible and treating rapidly interconverting atropisomers as achiral. The current lack of synthetic methodologies to obtain 'large-scale,' industry-standard quantities of atropisomerically-pure drug scaffolds, and the reliance on chiral HPLC separation, is not useful for medicinal chemists involved in the drug discovery process.

Personal Interests: Mariel still enjoys Harry Potter and frequently rewatches the series with a bowl of ice cream. She also enjoys going to rock concerts (particularly for music from the 60s, 70s, and 80s), and her pastime is walking around San Diego.

ARCS Award: I strongly think that the ARCS Foundation award has largely benefited me in alleviating financial stressors that are related to graduate student life. It means so much to me as well to know that I am amongst a group of students that can develop science towards the community. It resets my focus that science is to largely "change the world" and advance ourselves and improve the quality of humanity. As cheesy as it sounds, I've been super humbled and grateful to attend ARCS meetings. I've gotten to talk with so many people involved, and it's actually allowed me to become even more determined to shape my research with that goal in mind. With the award, I can really hone in and shape this research without worrying about the burdens in graduate student life (like money-problems, financial setbacks, etc.).

MOLLY ELIZABETH CLEMENS

San Diego State University / University of California Davis

College of Sciences

Concentration: Ecology

Specialization: Viticulture and AgroEcology

Donor: The Heller Foundation of San Diego

Molly's thesis is an interdisciplinary investigation of adaptations in vineyards, with the goal of sustainable agro-ecological solutions to the threats of climate change. She has modeled the phenological timing of hundreds of international grapevine varieties in response to climate change, and she reviewed in depth the impacts of elevated carbon dioxide on grapevine ecology. She is working on her last chapter at the Fondazione Edmund Mach in Italy on genetic transformations of grapevines using cutting edge CRISPR cas9 technology. These transformations developed grapevine with higher drought resistance.

Degree: B.S. in Environmental Science, Fordham University, New York City

Awards and Honors: Chateaubriand Fellowship, French Embassy 2019; Interdisciplinary Graduate Fellowship, Area of Excellence Center for Climate and Sustainability Studies, San Diego State University 2016 and 2017; Fulbright Graduate Research Fellowship 2014; Clare Boothe Luce Scholarship, Fordham 2013

Publication, Papers, and Posters:

Clemens, M.; Walker, A.; Wolkovich E. A comprehensive ecological study of grapevine sensitivity to temperature; How terroir will shift under climate change. GiESCO, Thessaloniki, Greece June 21-28, 2019

Valim, H.D.; **Clemens, M.E.**; Frank, H. Joint decision-making on two visual perception systems. Computational Intelligence, Cognitive Algorithms, Mind, and Brain (CCMB), 2014. IEEE Symposium

Current Research (expanded description): My dissertation in the Global Change Research Group focuses on the effects of climate change on vineyards in California, France, and Italy. We work on climate simulations to test genetic, phenological, and morphologic changes from elevated carbon dioxide and temperature on grapevines. I used microCT x-ray tomography scans to visualize changes in grapevine leaf tissue anatomy. I quantified microRNA to characterize graft incompatibility at the ISVV in France. I modeled the grapevine phenological response to climate, as well as an in-depth review of elevated carbon dioxide impacts on grapevine. At the Fondazione Edmund Mach in Italy, we are using CRISPR cas9 genetic transformations of grapevines for higher drought resistance. I am using previous RNAseq results to quantify gene expression in the transformed plants, compared to wild type, to identify genetic response to drought. This genetics work will contribute to a global effort to make grapevine a more sustainable crop. My thesis is an interdisciplinary investigation of adaptations in vineyards, with the goal of sustainable agro-ecological solutions to the threats of climate change.

Benefits to Science and Society: As an industry research leader, I will continue to promote agro-ecological solutions to climate problems, like carbon storage, reducing pesticide use, and water use efficiency improvement. The phenological model is open source information, which will help farmers identify climate sensitive varieties, as well as potential alternative varieties for planting. The genetic transformation of grapevine with lower stomata density will hopefully encourage higher drought resistance in grapevine. This material can be crossed with popular varieties and can be distributed globally to improve water use. This would be especially valuable to California, as we all strive for less water use.

Personal Interests: When I'm not in the lab or travelling, I love to be in the water surfing or paddle boarding. I spend a lot of time baking and cooking, which I think comes from my love of lab culture.

ARCS Award: It's hard to describe the impact the ARCS award has had on me, because the relief of financial stress is a gift that I truly can't say thank you for enough. I have been able to prioritize my research over financial stability. This year especially, I have been able to support myself, rather than ask for assistance from my family. It has been so validating to be supported by ARCS. It created security for me in probably the most insecure time of my life.

ROSLYNN BEATRICE KING

San Diego State University / University of California San Diego

College of Sciences

Concentration: Geophysics

Specialization: Controlled-Source Electromagnetism

Donor: Legler Benbough Foundation

Roslynn is interested in the design, fabrication, and use of controlled-source electromagnetic instruments to study hazards and potential resources located on the continental shelf that have direct implications for human life. More specifically, she is interested in identifying and analyzing marine hydrocarbon seeps, fluid pathways, freshwater resources, and archaeological sites so as to reduce ambiguity in current climate models, manage groundwater resources in coastal communities, and aid in the current understanding of human migration pathways.

Degree: B.S. in Geological Engineering, Colorado School of Mines

Awards and Honors: Award of Student Support - NOAA Office of OER 2020; Invited speaker Meeting of Science Advisory Panel of the Coastal Plain of SD Groundwater Sustainability Plan 2020; SCEC Travel Grant Award 2019; Award of Student Support - National Park Service Preservation Technology & Training Grant 2019

Publications, Papers, and Posters:

King, R.; Maloney, J.M.; Constable, S. Controlled-source electromagnetic methods (CSEM) to detect and characterize resources and hazards on the continental shelf. AGU Fall Meeting 2019. December 2019

King, R.; Maloney, J.M.; Constable, S.; Gusick, A.E.; Braje, T.; Ball, D. Feasibility of detecting submerged landforms and archaeological resources using controlled source electromagnetic methods. AGU Fall Meeting 2018. December 2018

Duross, C.; Hylland, M.D.; Hiscock, A.; Personius, S.; Briggs, R.; Gold, R.D.; Beukelman, G.S.; McDonald, G.N.; Erickson, B.A.; McLean, A.P.; Angster, S.J.; **King, R.B.**; Crone, A.J.; Mahan, S.A. Holocene surface-faulting earthquakes at the Spring Lake and North Creek sites on the Wasatch fault zone: Evidence for complex rupture of the Nephi Segment (Vol. 28, pp. 1-119). Utah Geological Survey 2017

DuRoss, C.B.; Hylland, M.D.; Hiscock, A.; Beukelman, G.; McDonald, G.N.; Erickson, B.; McKean, A.; Personius, S.F.; Briggs, R.; Gold, R.; Angster, S.; **King, R.**; Crone, A.J.; Mahan, S.A. Paleoseismic investigation to determine

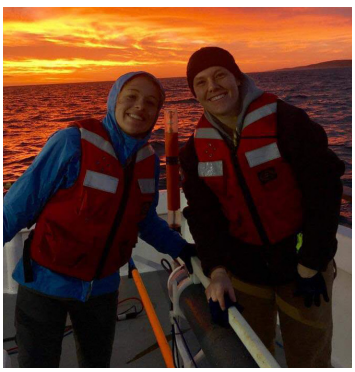
the mid-Holocene chronology of surface-faulting earthquakes on the Nephi segment of the Wasatch fault zone, Utah and Juab Counties, Utah. US Geological Survey, NEHRP Final Technical Report 2014

Current Research (expanded description): Sea-level rise following the Last Glacial Maximum (~20 kya) submerged millions of square kilometers of coastal landscape, obscuring multitudes of geologic phenomena, resources, and cultural sites from direct observation. Traditionally, the subseafloor of this region has been and is investigated using the seismic method, which is a valuable geophysical tool, but one that is not sensitive to all physical properties. Thus, the marine controlled-source electromagnetic (CSEM) method has experienced significant development as the method can be sensitive to geology and features that have little to no seismic signature. My research explores the use of CSEM to identify and characterize natural and anthropogenic resources on the continental shelf. These targets include shell middens (cultural sites of maritime hunter-gathers), marine hydrocarbon seeps, and submarine fresh groundwater. As shell middens are typically small and difficult to resolve, I am developing a novel bottom-towed CSEM system that is aimed to facilitate their discovery. Additionally, I have used CSEM methods to identify and characterize greenhouse-gas-emitting marine hydrocarbon seeps and sources. Finally, I have identified a significant lens of freshwater that extends offshore San Diego; I am still in the process of determining if this feature is a potential resource or a possible pathway for saltwater encroachment.

Benefits to Science and Society: My research aims to identify phenomena on the continental shelves that have been obscured from direct observations due to changes in sea level. These features may aid in our understanding of past climates and human histories or may be potential resources such as freshwater. Data regarding the locations and characteristics of these cultural and natural resources will help create robust strategies to protect and manage these targets located just offshore our coastal communities.

Personal Interests: Backpacking, painting, gardening, playing lacrosse, brewing beer, and diving into some solid podcasts.

ARCS Award: The ARCS award has made me feel more confident as a young scientist and has motivated me to produce research that will make this community proud. Additionally, this award has alleviated some of the financial stresses that arise from living in San Diego. With this burden lessened, I feel refreshed and excited to continue to produce high quality work and share my findings with my peers, scientific societies, and this organization.



LUCAS AARON LUNA

San Diego State University / University of California San Diego

College of Sciences

Concentration: Biochemistry

Specialization: Molecular Mechanisms of Diseases

Donor: Drs. Mara and Larry Yarbarrando / ARCS Foundation - San Diego Chapter

Lucas investigates mechanistic questions at the intersection of biochemistry, cell biology, and medicine. He explores how altered enzyme activity impacts human health using kinetic, structural and cellular tools. He is involved in several projects regarding altered protein function and cellular metabolism. Currently, his research project focuses on studying hypermutated phenotypes of human DNA polymerase epsilon, frequently present in colorectal cancer. He will study how exonuclease domain mutations affect fidelity and processivity to further understand how DNA replication errors are created and propagated.

Degree: B.S. in Biochemistry, University of California Santa Barbara

Awards and Honors: Tom Ragan Memorial Endowed Scholarship 2020; University Graduate Fellowship 2019: Prebys Biomedical Research Endowed Scholarship 2019; Harry E. Hamber Memorial Scholarship 2018, 2019

Publications, Papers, and Posters:

Luna, L. A.; Lesecq, Z.; Avellaneda Matteo, D.; White, K.A.; Hoang, A.; Scott, D.A.; Zagnitko, O.; Bobkov, B.A.; Barber, D.L.; Schiffer, J.M.; Isom, D.G.; Sohl, C.D. An acidic residue buried in the dimer interface of Isocitrate Dehydrogenase 1 (IDH1) helps regulate catalysis and pH sensitivity. Biochemical Journal 2020, 477(16), 2099-3018

Bernatchez, J.A.; Coste, M.; Beck, S.; Wells, G.A.; **Luna, L.A.**; Clark, A.E.; Zhu, Z.; Hecht, D.; Rich, J.N.; Sohl, C.D.; Purse, B.W.; Siqueira-Neto, J.L. Activity of selected nucleoside analogue protides against Zika virus in human neural stem cells. Viruses 2019, 11(4), 365-381

Avellaneda Matteo, D.; Wells, G.A.; **Luna, L.A.**; Grunseth, A.J.; Zagnitko, O.; Scott, D.A.; Hoang, A.; Luthra, A.; Swairjo, M.; Schiffer, J.M.; Sohl, C.D. Inhibitor potency varies widely among tumor-relevant human Isocitrate Dehydrogenase 1 (IDH1) mutants. Biochemical Journal 2018, 475(20), 3221-3238

Bernatchez, J.A.; Zunhua, Y.; Coste, M.; Li, J.; Beck, S.; Liu, Y.; Clark, A.E.; Zhu, Z.; **Luna, L.A.**; Sohl, C.D.; Purse, B.W.; Li, R.; Siqueira-Neto, J.L. Development and validation of a phenotypic high-content imaging assay for assessing the antiviral activity of small molecule inhibitors targeting the Zika virus. Antimicrobial Agents and Chemotherapy 2018, 62(10), 1-10

Current Research (expanded description): I study how changes in the cellular environment can reroute metabolism by altering the catalytic activities of metabolic enzymes such as Isocitrate Dehydrogenase 1 (IDH1). IDH1 catalyzes the reversible conversion of isocitrate to alpha ketoglutarate. There is an unmet need to show how changing the cellular environment regulates normal IDH1 activity. Typically, the forward and reverse reactions are balanced to meet the metabolic needs of the cell. However, when the cellular environment is perturbed by a change in pH, the catalytic activity of proteins can change and the equilibrium of the forward reaction and reverse reaction can be shifted. In our recent project , we investigated the biochemical and cellular pH-dependent consequences of IDH1 activity and provided a structural rationale for our observations. We concluded that the forward reaction of IDH1 is strongly pH dependent as reaction rate decreased as the pH became more acidic. When we then lowered the intracellular pH of cells chemically, we found that the concentrations of IDH1-related metabolites and tumor-related metabolites decreased – reflecting the results of our biochemical analysis. We then used computational algorithms to provide a structural basis for our biochemical observations and identified potential pH-sensing amino acid residues buried within the IDH1 core that may play a role in correct catalysis as well as pH sensitivity.

Benefits to Science and Society: With the Isocitrate Dehydrogenase project we hope to establish how metabolic enzyme activity is affected by changes in the cellular environment, and we hypothesize that the reverse reaction is favored at lower pH levels. We will also show how cellular metabolism is regulated by intracellular pH. In our new polymerase project, we will identify unique mechanisms of novel polymerase mutations and help inform a treatment strategy in colorectal and uterine cancer patients.

Personal Interests: I like jiu-jitsu, weight-lifting, hiking, hanging out with friends, and learning Portuguese

ARCS Award: The ARCS award has had a monumental influence on my passion and the quality of my work. It has increased my motivation to make lasting contributions to the scientific community, and I feel like it will accelerate my degree completion. The network that ARCS provides will also be invaluable to my career development, and I have enjoyed forming connections with my university cohorts. The award has made purchasing lab reagents and materials much easier, as well as facilitated day-to-day life here San Diego. The ARCS award has inspired me to give back to the student community at SDSU. I have decided to become more involved in chemistry tutoring and have started tutoring students in general chemistry, organic chemistry, and biochemistry. It is a very rewarding experience to give back to the community and I hope for it to continue through the rest of my PhD career. An additional benefit to the tutoring experience is that I can influence someone to continue a degree in chemistry or biochemistry and inspire them to seek out a research position.

TIFFANY LUONG

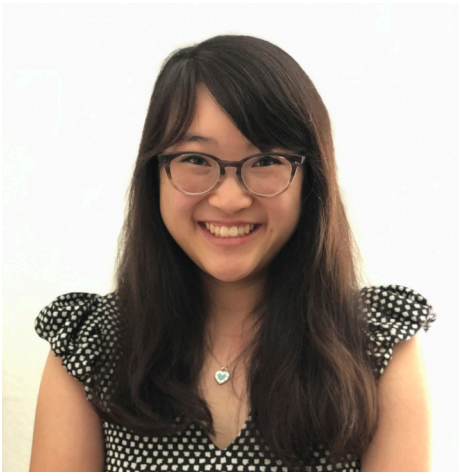
San Diego State University / University of California San Diego

College of Sciences

Concentration: Cell and Molecular Biology

Specialization: Phage Immunology

Donor: Hervey Family Fund Drs. Mara and Larry Ybarrondo / ARCS Foundation - SD Chapter



Bacteriophage (viruses that infect and kill bacteria) treatment currently lacks approval in the US, but when antibiotics fail to eradicate drug-resistant bacterial infections, the FDA can approve emergency phage treatment. During Tiffany's PhD research, she developed a phage production and purification method to produce high-quality clinically safe phage preparations for personalized patient treatment. This method addresses the current production bottleneck hampering access to phage therapy and standardizes the production of therapeutic phages to ensure patient safety. Her ongoing research will study the immunological interactions between phages and mammalian cells to ensure the safety of phage therapy.

Degree: B.S. in Molecular, Cell, and Developmental Biology, University of California Los Angeles

Awards and Honors: ARCS Award 2020-2021; 3rd Place, 3 Minute Thesis Competition, SDSU

Publications, Papers, and Posters:

Luong, T.; Salabarria, A.-C.; Roach, D.R. Phage therapy in the resistance era: Where do we stand and where are we going? Clinical Therapeutics 2020, 42, 1659-1680

Luong, T.; Salabarria, A.; Edwards, R.A.; Roach, D.R. Standardized bacteriophage purification for personalized phage therapy. Nature Protocols 2020, 15 (9), 2867-2890

Mizuno, C.M.; **Luong, T.**; Cederstrom, R; Krupovic, M.; Debarbieux, L.; Roach, D.R. Isolation and characterization of bacteriophages that infect citrobacter rodentium, a model pathogen for intestinal diseases. Viruses 2020, 12, 737

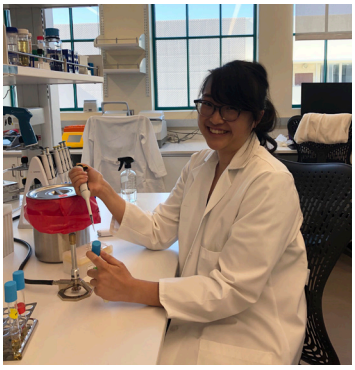
Flyak, A.I.; Ruiz, S.; Colbert, M.D.; **Luong, T.**; Crowe, J.E.; Bailey, J.R.; Bjorkman, P.J. HCV broadly neutralizing antibodies use CDRH3 disulfide motif to recognize an E2 glycoprotein site that can be targeted for vaccine design. Cell Host & Microbe 2018, 24, 703–716

Current Research (expanded description): In the US, phage therapy is considered an experimental treatment and can only be authorized by the FDA when antibiotic therapy has failed. Unfortunately, there are often bottlenecks when producing phages for human use. My first project was to develop a streamlined phage production method to cultivate phages at liter-scale and to test their purity and safety. This protocol allows for the timely production of phages at a higher quality and quantity than previously-used methods and provides a foundation to standardize the manufacturing of phages to help ensure treatment safety. However, there are still safety concerns for phage therapy. Successful treatment requires administration of over a billion phages every few hours to eradicate an infection. Although phages are generally regarded as safe, because they cannot infect mammalian cells, this interaction may induce inflammatory immune responses. Therefore, my ongoing research is to study the immunological safety of phages. Phages are comprised of DNA encapsulated in a protein coat, both of which can stimulate mammalian inflammatory responses. I am investigating the ability of phage DNA to trigger pattern recognition receptor Toll-like receptor 9 (TLR9) and whether this interaction triggers a pro-inflammatory cytokine response that worsens inflammation during phage therapy. A better understanding of the phages' ability to induce inflammatory immune responses will help guide proper phage strain selection to improve phage therapy safety and efficacy.

Benefits to Science and Society: Very few studies have looked into the safety and immunological response of therapeutic phage exposure to the human body. My research project uses a multidisciplinary approach of microbiology (working with bacterial strains), molecular biology (analyzing the immune response to phages at the protein level), bioinformatics (analyzing phage DNA), and cellular biology (using cell culture and mouse models) to decipher how phages are detected by mammalian cells and whether they cause inflammatory responses. These results will guide the selection of phage candidates for therapy and ensure the safety of phage therapy in the future.

Personal Interests: Some of my interests and hobbies include piano, tabletop role-playing games, mahjong, food & travel, video games, science fiction and fantasy literature.

ARCS Award: The ARCS Foundation award is an amazing opportunity for me in many respects: academically, financially, and professionally. Receiving this award has been both empowering and motivating. I am excited to have my achievements recognized and motivated to stay on my current trajectory. What's more exciting is the opportunity to discuss my research with not only my colleagues, but with scientific donors and members of the ARCS community that support my research efforts. Scientific communication is one of my passions and I look forward to ARCS meetings and opportunities to engage in it.



KYLE EVAN MALTER

San Diego State University / University of California San Diego

College of Sciences

Concentration: Biological Sciences

Specialization: Host-Microbe Biology

Donor: Hervey Family Fund

Kyle's research aims to understand how bacteria directly affect animal development. Identifying the mechanisms that bacteria use to influence animal development could have a wide range of impacts on the scientific community, such as understanding more complex systems, including the human gut microbiome. To study this, Kyle uses a marine tubeworm which requires bacteria for growth and development. This required interaction has allowed him to find key bacterial proteins which control the tubeworm's development. Kyle's future work aims to understand how human gut bacteria contribute to health and development.

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

Awards and Honors: James and Mary Crouch Memorial Scholarship 2018; American Society of Microbiology outstanding abstract award 2017; Graduated magna cum laude 2014, UCLA; UCLA Academic Scholarship 2012-2014

Publications, Papers, and Posters:

Cavalcanti, G.; Alker, A.; Delherbe, N.; **Malter, K.E.**; Shikuma, N.J. The influence of bacteria on animal metamorphosis. Annu. Rev. Microbiol. 2020, 74, in press. https://doi.org/10.1146/annurev-micro-011320-012753

Rocchi, I.; Ericson, C.F.; **Malter, K.E.**; Zargar, S.; Eisenstein, F.; Pilhofer, M.; Beyhan, S.; Shikuma, N.J. A bacterial phage tail-like structure kills eukaryotic cells by injecting a nuclease effector. Cell Rep. 2019, 28 (2), 295-301.e4. https://doi.org/10.1016/j.celrep.2019.06.019

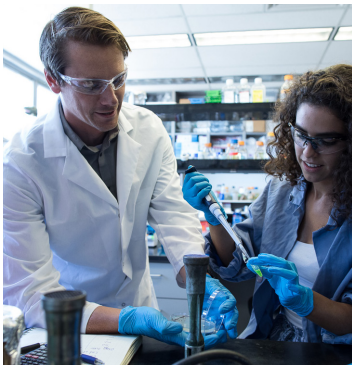
Ericson, C.F.; Eisenstein, F.; Medeiros, J.M.; **Malter, K.E**.; Cavalcanti, G.S.; Zeller, R.W.; Newman, D.K.; Pilhofer, M.; Shikuma, N.J. A contractile injection system stimulates tubeworm metamorphosis by translocating a proteinaceous effector. Elife 2019, 8, 1–19. https://doi.org/10.7554/eLife.46845

Current Research (expanded description): In my research, I hope to understand how bacterial communities may influence and contribute to animal development. I have recently made significant progress in understanding how bacterial proteins can be injected into animals and alter certain cellular processes. My work has determined that bacteria can inject proteins via a viral-like injection system directly into animal cells to control their function and behavior. The injection system is a complex array of virus-like tails, similar to T4 bacteriophage; however, protein instead of DNA is transported across the membrane. These tails have the ability to inject proteins into a marine tubeworm and stimulate metamorphosis. I have recently discovered two bacteria-produced proteins which are injected from the structure into the animal and control two major cellular processes. One protein is a toxin, which is targeted to the animal cell nucleus and degrades DNA; this protein is promiscuous and affects multiple diverse cell lines but not the marine tubeworm. The second bacterial protein can directly initiate the metamorphosis of the marine tubeworm. The work on the second protein sets the foundation for my continued studies, which aim to find the function of this injected protein and determine how it may influence cell signaling.

Benefits to Science and Society: The understanding of animal-bacteria interactions can inform future studies of highly complex microbial ecosystems. We can then begin to use more targeted methods to determine a highly directed role for these microbes in human and animal health. My long-term goal aims to understand how a complex mix of microbes associated with human and animal hosts contributes to and controls the normal hosts' development.

Personal Interests: In my free time I am an avid surfer, backpacker and guitar player. I am also an avid builder, shaping my own custom surfboards and handmade instruments.

ARCS Award: The ARCS Foundation award is an amazing opportunity for me to share my research with the broader community. In this time of false information, community outreach from working scientists has become increasingly more important. Being recognized as an ARCS Scholar is an amazing accomplishment and I am very grateful to be standing shoulder to shoulder with the elite scientists this foundation supports. This award will help springboard my career as a scientist, as the prestige and recognition will aid in increasing my networks and affiliations, both of which are very crucial to finding new opportunities in science.



AMELIA ODINE STONE-JOHNSTONE

San Diego State University / University of California San Diego

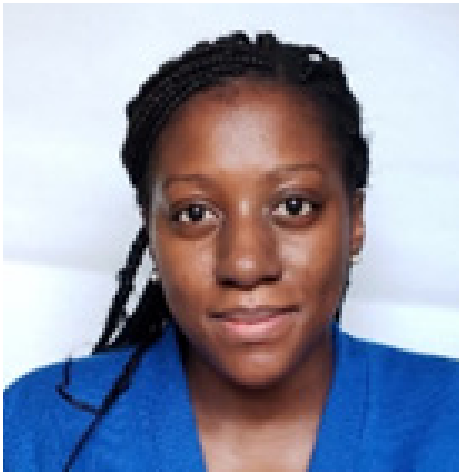
Center for Research in Mathematics and Science Education

Concentration: Mathematics Education

Specialization: Undergraduate Mathematics Education

Donor: Ingrid Benirschke-Perkins and Gordon Perkins

Amelia's research project aims to identify the impact that corequisite mathematics courses have on students intending to pursue majors in science, technology, engineering, and mathematics. A corequisite course is an instructional intervention where students are enrolled in a college-level course while simultaneously receiving academic support. The results from this research will help instructors and program coordinators design impactful support courses that will increase student retention, foster greater interest in the sciences, support students' educational growth, and prepare students for subsequent courses.



Degrees: M.A. in Mathematics, University of Southern California; B.S. in Mathematics, University of Rochester

Awards and Honors: Sowder Research Award, Fall 2020; Nicolas A. Branca Memorial Scholarship, Fall 2018; University of Southern California Provost Fellow, Fall 2011

Publications, Papers, and Posters:

Pilgrim, M.E.; McDonald, K.K.; Offerdahl, E.G.; Shadle, S.E.; Ryker, K.; **Stone-Johnstone, A**.; Walter, E.M. An exploratory study of what different theories can tell us about change. In Transforming Institutions: Accelerating systemic change in higher education; C. Henderson, M. Stains; Accelerating Systemic Change in STEM Higher Education Network; Pressbooks: forthcoming 2020

Reinholz, D.L.; **Stone-Johnstone, A**.; Shah, N. Walking the walk: Using classroom analytics to support faculty members to address implicit bias in teaching. International Journal for Academic Development 2019. https://doi.org/10.1080/1360144X.2019.1692211

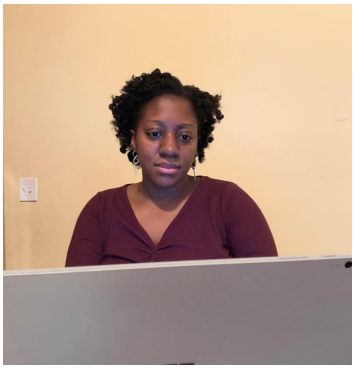
Reinholz, D.L.; Corrales, A.; **Stone-Johnstone, A**. The access network: supporting the construction of social justice physics identities through student partnerships. International Journal of Students as Partners 2019, 3(2). https://doi.org/10.15173/ijsap.v3i2.3788

Stone-Johnstone, A.; Reinholz, D.L.; Mullins, B.; Smith, J.; Andrews-Larson, C. Inquiry without equity: A case study of two undergraduate math classes. Proceedings of the 2019 Conference on Research in Undergraduate Mathematics Education. Oklahoma City, OK, February 2019

Current Research (expanded description): Developmental education programs simultaneously serve as gateways and gatekeeps to higher education for historically marginalized students. While these programs may equip students with the necessary tools needed for success in foundational STEM courses, students' academic path may be stymied by various features of developmental education (e.g., financial burden tied to the extended time to degree completion). Many states in the US have taken legislative action to end these programs, but ending them without replacing them with adequate academic support mechanisms does little to ameliorate the inequity experienced by marginalized students. One solution being explored is the corequisite model – where students are dually enrolled in a college-level course and a structured support mechanism. Research shows this model can improve course outcomes, but little is known about students' lived experiences while enrolled. My research addresses this pressing issue through three research aims: 1. describe how the corequisite model is implemented at two institutions. 2. examine how opportunities to engage in course content are dispersed in corequisites and how enrollment in a corequisite affects student engagement in their main course. 3. understand the impact on the student, in terms of perceptions of efficacy and interest in mathematics.

Benefits to Science and Society: The corequisite model was designed to support students needing additional academic support in college-level courses. There is a dearth of research around students' experiences in these courses. This research is meaningful since corequisites can potentially help address equity and access issues for marginalized populations in the sciences. The findings from this study can inform the development of future corequisite courses, as well as identify equitable practices that have contributed to student success in introductory mathematics courses.

ARCS Award: The ARCS Foundation award introduces an opportunity to connect with scholars across disciplines. I was enculturated into the field of mathematics education through involvement with the Center for Research in Mathematics and Science Education at SDSU. Through this network I was able to build meaningful relationships and learn from scholars across disciplines. I view this acceptance into the ARCS community as another opportunity to connect with scholars outside of my field. It is through these cross-disciplinary conversations that we can develop consequential and sustainable programs for STEM-intending undergraduates.



NICHOLAS BENJAMIN WILLIAMS

San Diego State University / University of California San Diego

College of Sciences

Concentration: Chemistry

Specialization: Renewable Energy

Donor: Virginia Lynch Grady Endowment

Nicholas is working on developing sustainable photoelectrochemical methods to generate hydrogen gas using semiconductor-organometallic hybrid materials to supply the growing hydrogen economy. This work has also developed methods of using surface sensitive techniques to observe catalyst decomposition. Additionally, he is using novel materials for electrochemical coenzyme regeneration. Coenzymes, which are used by enzymes to drive catalytic reactions, are costly and are one limitation to larger scale enzymatic catalysis. Being able to control recycle coenzymes in an efficient, scalable, and controllable manner would provide significant benefits in this field of catalysis.

Degrees: B.A. in Chemistry, Washington and Jefferson College, Washington PA; B.A. in Economics, Washington and Jefferson College

Awards and Honors: National Renewable Energy Lab Summer research internship, July 2019; SDSU Dept. Chemistry and Biochemistry Outstanding Masters Research Award, Fall 2017; ARCS Foundation, Inc. - San Diego Award, Fall 2017 to Present

Publications, Papers, and Posters:

Fang, C.; Li J.; Zhang, Y.; Yang, F.; Lee, J.L.; Lee, M.; Alvarado, J.; Wang, X.; Schroeder, M.; Yang, Y.; **Williams, N.**; Ceja, M.; Yang, L.; Cai, M.; Gu, J.; Xu, K.; Wang, X.; Meng, Y.S. Quantifying inactive lithium in lithium metal batteries. Nature 2019 572, 511-515

Huang, Y.; Sun, Y.; Zheng, X.; Aoki, T.; Pattengale, B.; Huang, J.; He, X.; Bian, W.; Younan, S.; **Williams, N.**; Hu, J.; Ge, J.; Pu, N.; Yan, X.; Pan, X.; Zhang, L.; Wei, Y.; Gu, J. Atomically engineering activation sites onto metallic 1T-MoS2 catalysts for enhanced electrochemical hydrogen evolution. Nat. Commun. 2019, 10 (1)

Zhou, Y.-H.; Wang, S.; Zhang, Z.; **Williams, N**.; Cheng, Y.; Gu, J. Hollow nickel-cobalt layered double hydroxide supported palladium catalysts with superior hydrogen evolution activity for hydrolysis of ammonia borane. ChemCatChem 2018, 10 (15), 3206–3213

Zhou Y.-H.; Zhang, Z.; Wang, S.; **Williams, N.**; Cheng, Y.; Luo, S.; Gu J. rGO supported PdNi-CeO2 nanocomposite as an efficient catalyst for hydrogen evolution from the hydrolysis of NH_3BH_3. Int. J. Hydrog. Energy 2018 43, 18745-18753

Current Research (expanded description): My research initially focused on bonding a monolayer of an organometallic catalyst onto a semiconductor interface for the photoelectrochemical generation of solar fuels. The desired fuel hydrogen gas was produced with a faradaic efficiency of nearly 100% but was produced at a decreasing rate, due to the decomposition of the molecular catalyst. From here I studied the decomposition of the catalyst using surface sensitive techniques. Using surface-sensitive methods such as XPS and simpler contact angle measurements, chemical changes can be monitored and observed on material interfaces with the purpose of monitoring catalyst degradation. More recently my work has focused on developing materials for electrochemical hydrogenation reactions, namely for the application of regenerating coenzymes for cell free enzyme cascade systems. In this study I have utilized transition metal dichalcogenides to reduce the oxidized form of nicotinamide adenine dinucleotide efficiently and selectively into its reduced form.

Benefits to Science and Society: My research produced a surface-sensitive methodology that can be used to observe the decomposition of organometallic catalysts; learning how and why catalysts fail can prove useful for the rational design of future catalysts. Secondly, my work on coenzyme recycling through electrochemical method has shown this to be selective, efficient and tunable. This work can prove fruitful in addressing a difficulty for the application of enzymatic catalysis due to the high cost of coenzymes.

Personal Interests: I enjoy camping at places like Death Valley, Yellowstone, and the Black Hills. Some of my other hobbies include painting and baking; I always enjoy making a warm loaf of bread on a day off.

ARCS Award: To me ARCS has provided several important tools to develop as a scientist. ARCS has proven an effective means to meet other young scientists in a variety of interesting fields and to open a door to meet many previous ARCS Scholars though this common bond. ARCS has also provided me with time to grow, not only as a scientist dedicated to my research but also as a person. I would otherwise have spent this time worrying about financial matters.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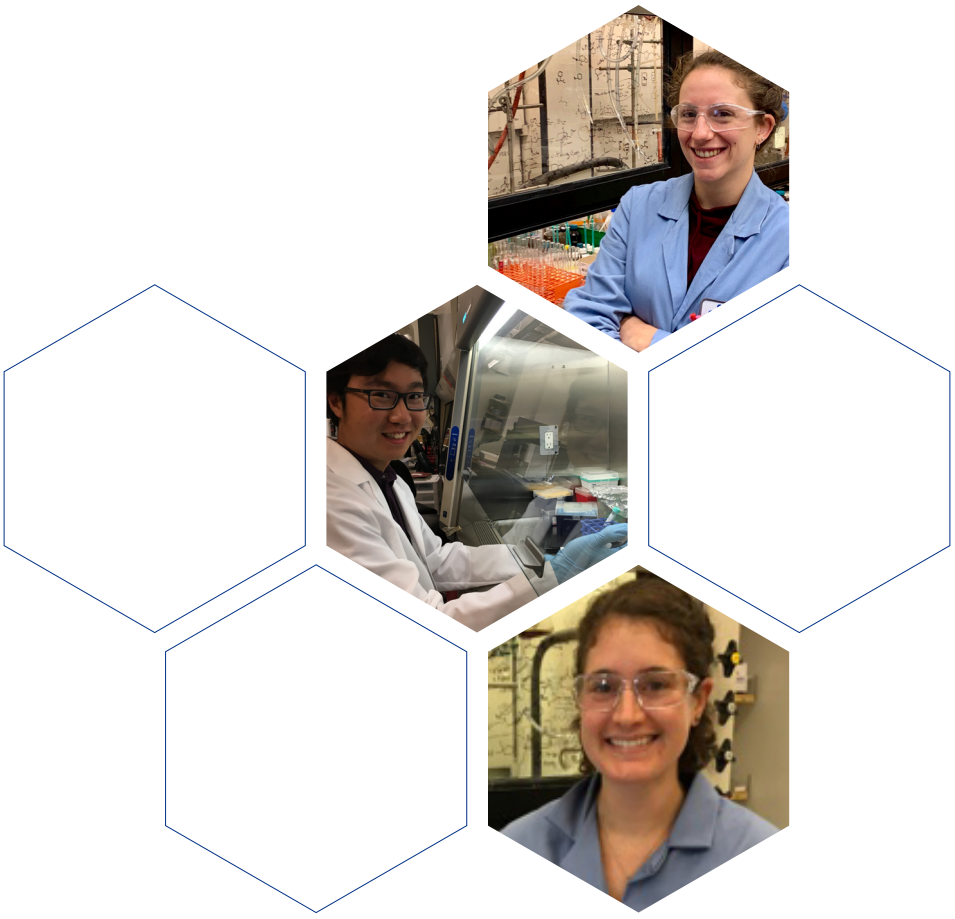


LISA MARIE BARTON

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Chemistry

Specialization: Organic Chemistry

Donor: Larry and Marti Showley / ARCS Foundation - San Diego

As a graduate student in the lab of Professor Phil Baran, Lisa's research focuses on the development of novel chemical transformations that aid in the synthesis of highly strained molecules. Rapid access to these motifs is useful to many different areas of organic chemistry, including the synthesis of pharmaceuticals, natural products and energetic molecules. The ability to access novel strained scaffolds, that would otherwise be very challenging to synthesize, will aid other chemists in their own research.

Degree: B.S. in both Biology and Chemistry, Northeastern University

Awards and Honors: ACS Women Chemists Committee Travel Award 2020; Bristol-Myers Squibb Graduate Fellowship, 2019-2020; ARCS Scholar, 2019-present; NSF Graduate Research Fellowship, 2018-Present

Publications, Papers, and Posters:

Barton, L.M.; Edwards, J.T.; Johnson, E.C.; Bukowski, E.J.; Sausa, R.C.; Byrd, E.F.; Orlicki, J.A.; Sabatini, J.J.; Baran, P.S. Impact of stereo- and regiochemistry on energetic materials. J. Am. Chem. Soc. 2019, 141, 12531-12535

Shang, M*; Feu, K.S.*; Vantourout, J.C.; **Barton, L.M.**; Osswald, H.L.; Kato, N.; Gagaring, K.; McNamara, C.W.; Chen, G.; Hu, L.; Ni, S.; Fernandez-Canelas, P.; Chen, M.; Merchant, R.R.; Qin, T.; Schreiber, S.L.; Melillo, B.; Yu, J.Q.; Baran, P.S. Modular, stereocontrolled Cb–H/Ca–C activation of alkyl carboxylic acids. PNAS 2019, 116, 8721-8727. * Equal contributions

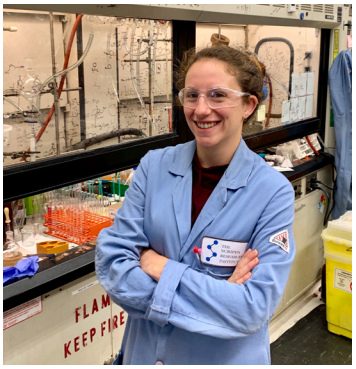
Chen, T.-C.*; **Barton, L.M.***; Lin, Y.*; Tsien, J.; Kossler, D.; Bastida, I.; Asai, S.; Bi, C.; Chen, J.S.; Shan, M.; Fang, H.; Fang, F.G.; Choi, H.; Hawkins, L.; Qin, T.; Baran, P.S. Building C(sp^3)-rich complexity by combining cycloaddition and C–C cross–coupling reactions. Nature 2018, 560, 350-354. *Equal contributions

Li, C.*; Wang, J.*; **Barton, L.M.**; Yu, S.; Tian, M.; Peters, D. S.; Kumar, M.; Yu, A. W.; Johnson, K. A.; Chatterjee, A. K.; Yan, M.; Baran, P. S. Decarboxylative borylation. Science 2017, 356, eaam7355. *Equal Contributions

Current Research (expanded description): Development of novel decarboxylative cross-coupling methodologies and strategies, as well as the synthesis of natural products. My initial research involved the discovery of a nickel-catalyzed decarboxylative borylation method for the installation of boronic esters and acids into complex scaffolds. I am currently working to improve this method by the development of a metal free, electrochemical variation of the same transformation. Similarly, a large portion of my research has focused on the synthesis and functionalization of strained ring systems. I coauthored a paper in which we combined the complexity generation of cycloaddition reactions with the modularity of decarboxylation cross-coupling reactions in order to synthesize enantioenriched 1,2-disubstituted cyclopropanes, cyclobutanes, cyclopropanes, and cyclohexanes. Furthermore, in collaboration with the Army Research Laboratory, I systematically studied the effect that stereo- and regiochemistry had on the energetic properties of a series of energetic cyclobutane nitric esters. Finally, the culmination of my research combines my interest in decarboxylative cross-coupling methods with the synthesis and functionalization of strained scaffolds through the ongoing total synthesis of several different polycyclopropane natural products such as jawsamycin.

Benefits to Science and Society: A direct societal benefit of my research is the discovery and rapid synthesis of pharmaceutical candidates. As demonstrated in several of my publications, my work has been directly applied to the synthesis of Velcade, Ninlaro, Saphris, and drug targets currently under investigation at Leo Pharma and Eisai Pharmaceuticals. In addition, several of the cyclobutane nitric esters I discovered in collaboration with the Army Research Laboratory are currently under investigation for their application to both explosives and propellants.

ARCS Award: I am incredibly humbled to have been chosen for the ARCS Foundation award. ARCS has done so much to advance the careers of those in STEM fields, and to be chosen as one of their scholars and therefore represent them is a tremendous honor. Not to mention, as a female scientist myself in a field dominated by men, I feel particularly grateful to be chosen by an organization run entirely by women. In addition to the valuable connections that I am sure to make through the ARCS Foundation, the financial support afforded by this award will go far in helping me complete my studies at Scripps Research. Not only will it help me on a day to day basis, but as I enter the later portion of my Ph.D. studies, I plan to attend several conferences; this will provide me both the opportunity to present my research as well as meet and discuss cutting edge chemistry with my colleagues.



NATHALIA ROMANIO GAZANIGA

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Biomedical Sciences

Specialization: Immunology

Donor: Paul Bechtner Foundation / ARCS Foundation – San Diego

Nathalia utilizes high throughput drug screening methods to identify small molecule immunomodulators in the context of tumors. By being a part of both a chemical biology and an immunology lab, she can screen for small molecules and subsequently work to understand their mechanism in vitro and in vivo. Her project focuses on applying these small molecules to alter the balance of immune cell populations in the tumor microenvironment.

Degree: B.S. in Biological Sciences, Florida Atlantic University

Awards and Honors: Undergraduate Researcher of the Year for 2015, College of Medicine, Florida Atlantic University 2016; 1st place Oral Presentation, Undergraduate Research Symposium, Florida Atlantic University 2016, 2015

Publications, Papers, and Posters:

Tsai, W.L.; Vian, L.; Giudice, V.; Kieltyka, J.; Liu, C.; Fonseca, V.; **Gazaniga, N.**; Gao, S.; Kajigaya, S.; Young, N.S.; Biancotto, A.; Gadina, M. High throughput pSTAT signaling profiling by fluorescent cell barcoding and computational analysis. Journal of Immunological Methods 2020, 477, 112667

Vian, L.; Le, M.T.; **Gazaniga, N.**; Kieltyka, J.; Liu, C.; Pietropaolo, G.; Dell'Orso, S.; Brooks, S.R.; Furumoto, Y.; Thomas, C.J.; O'Shea, J.J.; Sciumè, G.; Gadina, M. JAK inhibition differentially affects NK cell and ILC1 homeostasis. Frontiers in Immunology 2019, 10, 2972

Gadina, M.; **Gazaniga, N.**; Vian, L; Furumoto, Y. Small molecules to the rescue: Inhibition of cytokine signaling in immune-mediated diseases. J Autoimmun. 2017, 85, 20-31

Libreros, S.; Garcia-Areas, R.; Keating, P.; **Gazaniga, N.**; Robinson, P.; Humbles, A.; Iragavarapu-Charyulu, V. Allergen induced pulmonary inflammation enhances mammary tumor growth and metastasis: Role of CHI3L1. J Leukoc Biol. 2015, 97(5), 929-940

Current Research (expanded description): In the Lairson and Teijaro laboratories, my project focuses on understanding the mechanism of compounds, previously identified by our lab, that alters regulatory T cell differentiation. Additionally, I have also conducted high throughput flow cytometry screens to identify small molecules with effects on different T cell populations. By understanding these small molecules' specific targets in these cells, we aim to determine their downstream pathways. Additionally, our goal is to utilize these small molecules to change the balance of immune cell populations in the tumor microenvironment with the hope of contributing to cancer therapy.

Benefits to Science and Society: T cells are composed of different subsets that are capable of either suppressing or enhancing tumor clearance. Two examples are regulatory T cells that have been correlated with increased tumor progression and effector T cells that aid in controlling tumor growth. Therefore, it is essential to identify new modes of inhibiting or augmenting these cell populations' presence in the tumor microenvironment that can be potentially utilized as cancer therapies.

ARCS Award: The ARCS Foundation award allows me to continue to conduct research in areas I am passionate about and to contribute to the scientific field. Thank you so much once again.

TUCKER RYAN HUFFMAN

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Chemistry

Specialization: Organic Synthesis

Donor: Reuben H. Fleet Foundation Fund

Tucker's research is currently focused on the chemical synthesis of a biologically active fungal natural product that has exhibited anticancer activity. Access to this material will allow both investigations into its use as a therapeutic agent and studies into how this molecule kills cancer cells. Because of the complexity of the target molecule, Tucker is exploring new reactions that allow the natural product to be made quickly from much simpler, less expensive starting materials.

Degree: B.S. in Chemical Biology, University of California Berkeley

Awards and Honors: NSF Graduate Research Fellowship, June 2019; Departmental Citation in Chemistry, May 2017; University Medal Finalist, May 2017

Publications, Papers, and Posters:

Berdan, C.A.; Ho, R.; Lehtola, H.S.; To, M.; Hu, X.; **Huffman, T.R.**; Petri, Y.; Altobelli, C.R.; Demeulenaere, S.G.; Olzmann, J.A.; Maimone, T.J.; Nomura, D.K. Parthenolide covalently targets and inhibits focal adehesion kinase in breast cancer cells. Cell Chem. Biol. 2019, 26, 1027

Green, S.A.; **Huffman, T.R.**; McCourt, R.O.; van der Puyl, V.; Shenvi, R.A. Hydroalkylation of olefins to form quaternary carbons. J. Am. Chem. Soc. 2019, 141, 7709

Huffman, T.R.; Wu, Y.; Emmerich, A.; Shenvi, R.A. Intermolecular heck coupling with hindered alkenes directed by potassium carboxylates. Angew. Chem. Int. Ed. 2019, 58, 2371

Grossman, E.; Ward, C.C.; Spradlin, J.N.; Bateman, L.A.; **Huffman, T.R.**; Miyamoto, D.K.; Kleinman, J.I.; Nomura, D.K. Covalent ligand discovery against druggable hotspots targeted by anti-cancer natural products. Cell Chem. Biol. 2017, 24, 1

Current Research (expanded description): Cotylenin A is a fungal metabolite with characterized cytokinin-like and anticancer activity, presumably via its interaction with the 14-3-3 regulatory protein family. While a large family of related natural products is known to interact with 14-3-3, the bioactivity of cotylenin A is distinct. This suggests there are important, underappreciated subtleties in the ternary interaction of 14-3-3, its endogenous phosphopeptide substrates, and these small molecule modulators. Due to the death of the parent fungal strain of unknown species from which it was isolated, chemical synthesis is currently the only means of accessing this material. I am currently pursuing a convergent total synthesis that will provide quick access to both cotylenin A and natural and unnatural analogues for in-depth biological study. Central to the strategy being pursued is the formation of the key quaternary stereocenter from an alkene starting material, allowing rapid complexity building from simple substrates. With access to this key 14-3-3 protein binding scaffold, the divergent bioactivities of the family members will be examined to understand the structural features driving phenotypic differences and system-level responses of cells to 14-3-3 modulation.

Benefits to Science and Society: The successful completion of this work will serve to directly provide access to an anticancer compound that could be developed into a novel therapeutic for cancer patients. Furthermore, 14-3-3 proteins regulate a diverse set of biological processes that are relevant to other diseases such as neurodegeneration and viral infection. Understanding how to modulate the behavior of 14-3-3 proteins with small molecules could produce novel strategies for the treatment of these diseases.

Personal Interests: I enjoy participating and serving in my local church, running, and rock climbing.

ARCS Award: Much of the scientific process involves struggling through long series of failed experiments and complicated data, which is often significantly draining. The support of the ARCS Foundation is both personally encouraging and a reminder that the work being put in is valuable and appreciated by those in the broader community. I was thrilled and deeply thankful when I heard that I received this recognition, and I hope to continue performing high quality research over the course of my studies that does justice to this award.

ANTHONY NICHOLAS MILIN

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Biomedical Sciences

Specialization: Phase Separation in Biology

Donor: : Helga Moore / ARCS Foundation – San Diego Chapter

Each year in America, nearly 1.7 million adults develop sepsis, nearly 270,000 Americans die as a result of sepsis, and 1 in 3 patients who die in hospitals have sepsis. Recent research has identified the growth-arrested state of bacteria as essential to understanding pathogenesis, yet its physiology remains poorly understood. Early investigations point towards liquid-liquid phase separation as one potential starvation protection mechanism for bacteria. By deciphering the physical basis of phase separation and the proteins/molecules that regulate this process, we hope to contribute to the future development of novel antibiotics.

Degree: B.A. in Chemistry, University of California Berkeley

Awards and Honors: The Donald and Delia Baxter Fellowship 2016; The Scripps Research Institute Dean's Fellowship 2016

Publications, Papers, and Posters:

Onuchic, P.L.*; **Milin, A.N.***; Alshareedah, I.; Deniz, A.A.; Banerjee, P.R. Divalent cations can control a switch-like behavior in heterotypic and homotypic RNA coacervates. Scientific Reports 2019, 9 (1). *Equal contributions

Milin, A.N.; Deniz, A.A. Reentrant phase transitions and non-equilibrium dynamics in membraneless organelles. Biochemistry 2018, 57 (17), 2470–2477.

Banerjee, P.R.*; **Milin, A.N.***; Moosa, M.M.*; Onuchic, P.L.; Deniz, A.A. Reentrant phase transition drives dynamic substructure formation in ribonucleoprotein droplets. Angewandte Chemie International Edition 2017, 56 (38), 11354–11359. *Equal contributions

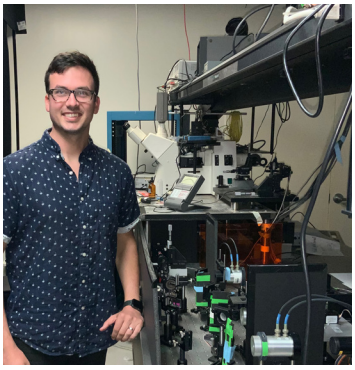
Goldman, D.H.*; Kaiser, C.M.*; **Milin, A**.; Righini, M.; Tinoco, I.; Bustamante, C. Mechanical force releases nascent chain-mediated ribosome arrest in vitro and in vivo. Science 2015, 348 (6233), 457–460. *Equal contributions

Current Research (expanded description): Over the years, I have covered a broad array of research topics and changed my research focus greatly. Originally trained as a chemist, I transitioned from surface functionalization and catalytic chemistry into biophysics at the single-molecule level by researching the mechanical effects of protein folding on the ribosome exit tunnel using optical tweezers. This research began in the Bustamante lab at UC Berkeley and carried over into my time in the Kaiser lab at Johns Hopkins University. Scripps Research's focus on translational science influenced my decision to pursue my PhD in the Deniz lab, where I currently use single-molecule fluorescence techniques to investigate the mesoscale phenomena of liquid-liquid phase separation. Liquid-liquid phase separation is a universal process that aids in the colocalization of biomolecules and acts as a biomolecular selectivity filter. Numerous recent reports have stressed its essential role in neurodegenerative diseases as well as other health-related processes. Recently, I have transitioned into understanding how this process pertains to the bacterial starvation mechanism. Bacteria are able to colocalize and store their necessary components under various stress responses. This alteration in their cytoplasm leads them to attaining a resistance to common antibiotics and can allow for these bacteria to persist for many years. By understanding the mechanism by which they protect themselves and store their core components, we hope to develop novel therapeutics to treat bacterial infections.

Benefits to Science and Society: Each year in America, nearly 1.7 million adults develop sepsis, nearly 270,000 Americans die as a result of sepsis, and 1 in 3 patients who die in hospitals have sepsis. In order to mitigate sepsis as well as other bacterial-related infections, I am currently investigating the underpinning role of liquid-liquid phase separation in the bacterial starvation mechanism. By understanding the underlying mechanism, we hope to develop novel antibiotics to treat multidrug-resistant bacteria.

Personal Interests: I've always pushed myself to travel and live outside of my comfort zone. Recently, I have explored science illustration through acrylic and watercolor. I'm also an avid reader, hiker, and animal lover.

ARCS Award: The ARCS Foundation award presents vital support not only in a monetary sense, but also with the ability to network with fantastically bright and innovative people. Science would not be possible without the generosity of institutions like you, and I hope that you understand just how important this is for breakthrough discoveries and research to take place. I greatly appreciate the honor of receiving the award, and I hope you understand how crucial it is to both my development as a scientist as well as propelling science forward.



SOPHIA LOUISE SHEVICK

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Chemistry

Specialization: Organic Chemistry

Donor: Virginia Lynch Grady Endowment

Sophie's current project is the synthesis of a natural product (originally isolated from mushrooms) that targets the kappa opioid receptor (KOR). Sophie plans to make this same natural product in the lab, using commercially available starting materials. A synthetic route to this natural product will provide enough material for biological study, while also allowing for deep-seated changes to be made to the chemical scaffold. In the process, Sophie hopes to learn about chemical reactivity while synthesizing this tool to study opioid pharmacology. There is potential for this molecule to serve as a starting point for a non-addictive pain medication.

Degree: B.Sc. in Chemical Biology, University of California Berkeley

Awards and Honors: Lesly Starr Shelton Award for Excellence in Graduate Studies; TL1 translational NIH training grant; Graduated cum laude from UC Berkeley College of Chemistry

Publications, Papers, and Posters:

Shevick, S.L.; Obradors, C.; Shenvi, R.A. Mechanistic interrogation of Co/Ni-dual catalyzed hydroarylation. J. Am. Chem. Soc., 2018, 140, 12056–12068)

Shevick, S.L.; Obradors, C.; Shenvi, R.A. Mechanistic interrogation of Co/Ni-dual catalyzed hydroarylation. Organic Reactions and Processes Gordon Conference, Easton, MA, July 2019 (poster).

Current Research (expanded description): The Shenvi Lab group utilizes synthetically complex natural product (NP) and NP-like scaffolds as starting points to study challenging biological targets. One target of interest is the kappa opioid receptor (hKOR), a GPCR involved in cognition, mood, nociception (pain perception) and pruritus (itch) that has emerged as an important target for the development of new drugs to manage pain. Previously, our lab explored the synthesis of a modified salvinorin A (SalA) analog - 20-nor-SalA - which exhibited equipotent hKOR agonism to SalA, as well as increased chemical stability under basic conditions. A similar NP

starting point is collybolide, a sesquiterpene isolated from the Collybia maculata mushroom, and a selective hKOR agonist with potent anti-pruritic activity in mice. Both SalA and collybolide share a furyl-delta-lactone motif and are non-nitrogenous agonists of the hKOR, yet exhibit notable differences including; 1) different absolute stereochemistry at the 3-furan; 2) different biological origins; 3) and different core structures. Synthetic access to collybolide will enable us to further probe hKOR pharmacology and biased agonism by providing novel chemical space from which to interrogate small molecule binding at the hKOR.

Benefits to Science and Society: The NIH has called for "all scientific hands on deck" to address the US opioid crisis, including the development of small molecule therapeutics as non-addictive treatments for chronic pain. While pharmaceutical companies typically focus on structural chemotypes that are readily diversifiable, complex scaffolds are frequently passed over due to limited synthetic access to analogs. My research project, aimed at exploring the synthesis of complex natural products, provides access to small molecule tools to understand targeting the hKOR, with important implications for understanding chemical reactivity and human health.

Personal Interests: Sophie enjoys practicing yoga, baking banana bread, and fermenting foods (usually on purpose).

ARCS Award: Throughout my PhD, I have felt simultaneously challenged and rewarded by my work in organic chemistry. It's incredibly motivating when that work is recognized and encouraged by an outside organization. Thank you again for seeing my potential - it means so much!

MIA SHIN

Scripps Research

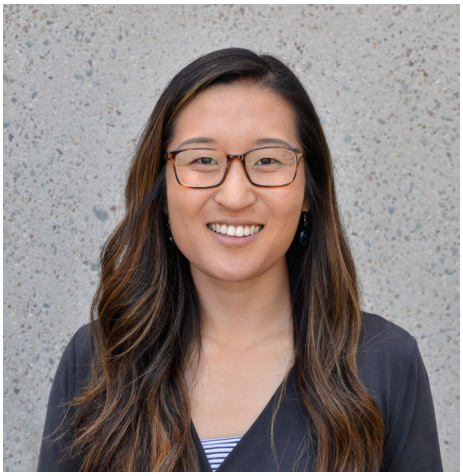
Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Biomedical Sciences

Specialization: Biophysics and Structural Biology

Donor: Peggy Hanley and Hamp Atkinson

For her graduate studies, Mia is using state-of-the-art electron microscopes to solve the structures of proteins that regulate mitochondrial health. By understanding the structure of these essential proteins, she is looking to understand the mechanism of how they work in the cell to maintain health and how they are dysregulated in the context of human disease, as well as to consider potential therapeutic strategies for neurodegenerative diseases such as Alzheimer's and Parkinson's.



Degrees: B.A. in Molecular and Cell Biology, B.A. in Public Health, University of California Berkeley

Awards and Honors: Best Poster Award at the Protein Society Annual Meeting; Graduate Research Fellowship from the National Science Foundation; Fletcher Jones Foundation Fellowship; Dean's Fellowship

Publications, Papers, and Posters:

Shin, M.; Puchades, C.; Asmita, A.; Puri, N.; Adjei, E.; Wiseman, R.; Karzai, A.; Lander, G. Structural basis for distinct operational modes and protease activation in AAA+ protease lon. Science Advances 2020, 6, eaba8404

Shin, M.; Asmita, A.; Puchades, C.; Adjei, E.; Wiseman, R.L.; Karzai, A.W.; Lander, G.C. Distinct structural features of the lon protease drive conserved hand-over-hand substrate translocation. (In Review)

Guinn, E.J.; Tian, P.; **Shin, M.**; Best, R.B.; Marqusee, S. A small single-domain protein folds through the same pathway on and off the ribosome. PNAS 2018, 115, 12206-12211

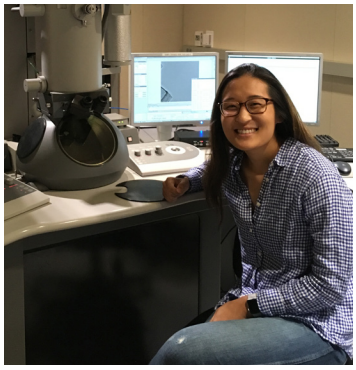
Puchades, C.; Rampello, A.J.; **Shin, M.**; Giuliano, C.J.; Wiseman, R.L.; Glynn, S.E.; Lander, G.C. Atomic structure of the mitochondrial inner membrane AAA+ protease YME1 reveals the mechanism of substrate processing. Science 2017, 358

Current Research (expanded description): For my graduate studies, I am conducting research in the labs of Drs. R. Luke Wiseman and Gabriel Lander where I am investigating how mitochondria employ a complex network of proteases to maintain protein homeostasis, or proteostasis and prevent pathogenesis of aging-related disorders, such as neurodegeneration. For my thesis research, I am interested in combining biophysical techniques, namely cryo-electron microscopy (cryo-EM) and cell biology to understand how ATP-dependent quality control proteases in mitochondria work together to maintain organellar proteostasis, as well as characterizing unique features that allow these proteases to identify diverse substrates and regulate almost all aspects of mitochondrial biology.

Benefits to Science and Society: By elucidating structures of essential mitochondrial quality control proteins, we will understand their mechanism, how they work in the cell, and how they are dysregulated in the context of human disease. Ultimately, we will be able to consider potential therapeutic strategies for aging-related disorders, such as neurodegeneration.

Personal Interests: Volunteering with my church, running, drinking coffee, cooking, and baking.

ARCS Award: Thank you so much for your generosity towards our Graduate Program at Scripps Research and graduate students like myself. I have long since admired the prestige of the ARCS Foundation award and the caliber of scientific achievement that came from named scholars in our program. It is now with great privilege and humility that I receive this magnanimous gift and the title of an ARCS Scholar. This award will indubitably support my lifelong goal of understanding the molecular underpinnings of neurodegenerative diseases, such as Alzheimer's and Parkinson's, with the ultimate goal of discovering potential therapeutic strategies for these debilitating diseases. Thank you, again for making dreams like this become one step closer to a reality.



NELSON REN WU

Scripps Research

Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Immunology

Specialization: Vaccine Design

Donor: Laurie and Michael Roeder

Malaria is an ancient tropical disease caused by parasites carried by mosquitoes. While insecticide-treated nets and anti-malarial drugs have largely contributed to a decline in malaria cases, increasing drug resistance by malaria parasites necessitates the development of an effective vaccine. The most advanced vaccine for malaria is the RTS,S/AS01 vaccine approved for use in select African countries, but that is only partially effective. Nelson's research seeks to apply computational modeling to design and screen more effective vaccine candidates.

Degree: B.S. in Biomedical Engineering, Washington University in St. Louis

Awards and Honors: ARCS Scholar; WUSTL Dean's List; Byrd Honors Scholarship

Publications, Papers, and Posters:

Saunders, K.O.; Wiehe, K.; Tian, M.; Acharya, P.; Bradley, T.; Alam, S.M.; Go, E.P.; Scearce, R.; Sutherland, L.; Henderson, R.; Hsu, A.L.; Borgnia, M.J.; Chen, H.; Lu, X.; **Wu, N.R.**; Watts, B.; Jiang, C.; Easterhoff, D.; Cheng, H.L.; McGovern, K.; Waddicor, P.; Chapdelaine-Williams, A.; Eaton, A.; Zhang, J.; Rountree, W.; Verkoczy, L.; Tomai, M.; Lewis, M.G.; Desaire, H.R.; Edwards, R.J.; Cain, D.W.; Bonsignori, M.; Montefiori, D.; Alt, F.W.; Haynes, B.F. Targeted selection of HIV-specific antibody mutations by engineering B cell maturation. Science 2019, 366 (6470)

Wu, N.R.; Nicely, N.I.; Lee, E.M.; Reed, R.K.; Watts, B.E.; Cai, F.; Walkowicz, W.E.; Aussedat, B.; Jones, J.A.; Eaton, A.; Trama, A.M.; Alam, S.M.; Montefiori, D.C.; Haynes, B.F.; Saunders, K.O. Cooperation between somatic mutation and germline-encoded residues enables antibody recognition of HIV-1 envelope glycans. PLoS Pathog 2019, 15 (12), e1008165

Saunders, K.O.; Nicely, N.I.; Wiehe, K.; Bonsignori, M.; Meyerhoff, R.R.; Parks, R.; Walkowicz, W.E.; Aussedat, B.; **Wu, N.R.**; Cai, F.; Vohra, Y.; Park, P.K.; Eaton, A.; Go, E.P.; Sutherland, L.L.; Scearce, R.M.; Barouch, D.H.; Zhang, R.; Von Holle, T.; Overman, R.G.; Anasti, K.; Sanders, R.W.; Moody, M.A.; Kepler, T.B.; Korber, B.; Desaire, H.; Santra, S.; Letvin, N.L.; Nabel, G.J.; Montefiori, D.C.; Tomaras, G.D.; Liao, H.X.; Alam, S.M.;

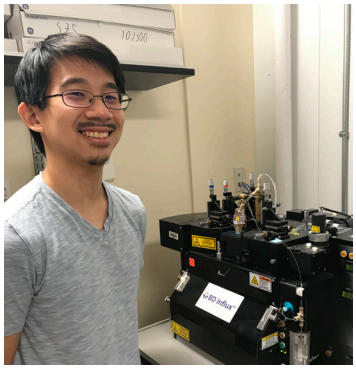
Danishefsky, S.J.; Haynes, B.F. Vaccine elicitation of high mannose-dependent neutralizing antibodies against the V3-glycan broadly neutralizing epitope in nonhuman primates. Cell Rep 2017, 18 (9), 2175-2188

Current Research (expanded description): In the pursuit of a better malaria vaccine, I combine yeast surface display and computational modeling to isolate designs according to novel vaccine strategies, epitope scaffolding and germline targeting. I begin with Rosetta Design software which identifies low free energy sequences for target proteins in order to design structures that can accommodate artificial substitutions or to increase binding affinities. However, modeling cannot perfectly model a biological system, and so it is important to take the large library of outputs and display them on the surface of yeast cells for screening against antibodies of interest. With this, one can isolate the optimized immunogens. I use these to accommodate artificial substitutions in epitope scaffolding, the technique of grafting a desired epitope onto another protein in order to generate conformationally-stable protein scaffolds that accurately mimic the epitope structure and induce neutralizing antibodies. I also use this process to increase binding affinity in germline targeting, the technique of designing priming immunogens that have appreciable affinity to precursors of neutralizing antibodies in order to initiate antibody induction. Both strategies have shown merit in other vaccine fields, and I hope that this novel application to malaria will sufficiently improve its vaccine.

Benefits to Science and Society: Malaria is a global health risk with an estimated 3.4 billion people in 92 countries at risk of being infected and developing disease. While RTS,S is a major step forward in malaria treatment, its partial effectiveness means it is unable to eradicate malaria in endemic regions. A vaccine made with germline targeting can potentially increase positive response of the immune system while a vaccine made with epitope scaffolding can potentially direct immune response to the most potent epitopes.

Personal Interests: In my spare time, I like performing Chinese-Yoyo, reading fantasy novels, and playing with my Siamese cat.

ARCS Award: The ARCS Foundation award is a great opportunity for me and for other scientists to meaningfully engage with others not directly doing research and share our cutting-edge work. More relationships between ground-floor researchers and donors should be fostered in order to better expand science education. I look forward to meeting science philanthropists and learning how to advance STEM interest in my local community.



LEONARD HEEKYU YOON

Scripps Research

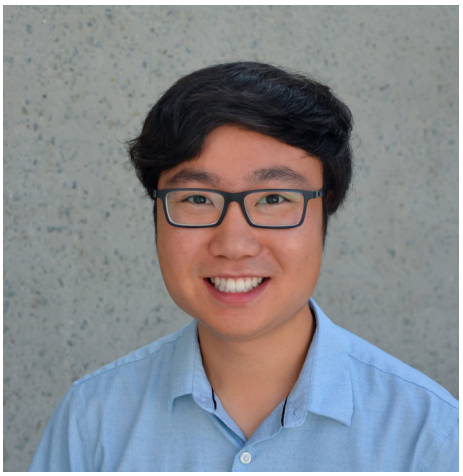
Skaggs Graduate School of Chemical and Biological Sciences

Concentration: Chemical Biology

Specialization: Molecular Medicine

Donor: Karen and Robert Bowden

In the Kelly lab, I am following up on a high-throughput screen that yielded small molecule autophagy activators. After discovering transcriptional and translational targets of these small molecules using RNA-Seq and MS/MS, I aim to synthesize more potent and selective analogs that can ameliorate neurodegenerative disease phenotypes in mammalian cell models. In the Dawson lab, I am attempting to synthesize a D-space Fyn SH2 superbinder for phosphotyrosine-containing substrates. I aim to inhibit overactivated signaling pathways found in various cancers using the superbinder, which will be less susceptible to proteolysis in cells.



Degree: B.A. in Chemistry and Statistics, Amherst College

Awards and Honors: Shirley and Ralph Shapiro Graduate Fellow Award, Scripps Research 2019; Everett H. Pryde Research Award, Amherst College Chemistry Department 2018; White Prize, Amherst College Chemistry Department 2017

Publications, Papers, and Posters:

Flood, D.T.; Asai, S.; Zhang, X.; Wang, J.; **Yoon, L.**; Adams, Z.C.; Dillingham, B.C.; Sanchez, B.B.; Vantourout, J.C.; Flanagan, M.E.; Piotrowski, D.W.; Richardson, P.; Green, S.A.; Shenvi, R.A.; Chen, J.S.; Baran, P.S.; Dawson, P.E. Expanding reactivity in DNA-encoded library synthesis via reversible binding of DNA to an inert quaternary ammonium support. Journal of the American Chemical Society. 2019. 141, 25, 9998-10006

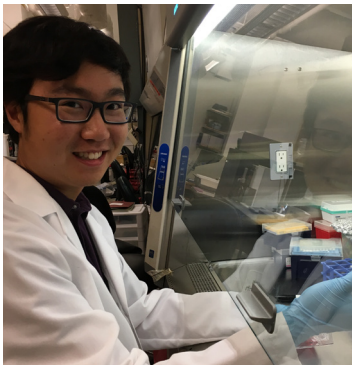
Chen, W.; Dong, J.; Li, S.; Liu, Y.; Wang, Y.; **Yoon, L.**; Wu, P.; Sharpless, K.B.; Kelly, J.W. Synthesis of sulfotyrosine-containing peptides by incorporating fluorosulfated tyrosine using an Fmoc-based solid-phase strategy, Angewandte Chemie. 2016. 128, 1867-1870

Current Research (expanded description): My research in the Kelly lab is inspired by aggregation of intrinsically-disordered proteins, abnormal lipid droplet accumulation, mitochondrial dysfunction and increased oxidative stress seen in neurodegenerative diseases (ND). We hypothesize that the inability of the cell to clear these potentially harmful cellular components drives ND progression. Autophagy is an important pathway in the degradation of protein aggregates, lipid droplets and organelles. Previously, pharmacologic activation of autophagy has normalized this pathogenic signature, largely through mTOR inhibition. In addition to being a master regulator of autophagy, mTOR is a major signaling hub with roles in growth, metabolism and immune function. So mTOR-independent autophagy activation would potentially reduce harmful side-effects for ND patients. Development of a selective and potent small molecule mTOR-independent autophagy activator would be broadly useful to the scientific community. To enable my project, the Kelly lab recently executed a lipid droplet-degradation based screen of a million compounds to discover novel autophagy activators utilizing high content imaging. After hit validation, confirmation of dose-dependent activity, elimination of fluorescent artifacts and replication of activity in additional cell lines, approximately twenty-four compounds were prioritized. The objective of my research is to determine the mechanism of action of two mTOR-independent autophagy activators and develop them into selective and potent pharmacologic autophagy activators for use by a spectrum of scientists.

Benefits to Science and Society: Development of selective and potent mTOR-independent autophagy activators, which we would openly distribute, would be broadly useful to scientists studying autophagy in diverse biological contexts. One such context could be cancer research, since autophagy promotes cellular senescence and protects against genome instability. Another context could be neurodegenerative disease research, since the pharmacologic activation of autophagy has been shown to clear protein aggregates, lipids and organelles.

Personal Interests: I am a clarinetist in the Coastal Communities Concert Band. I play tennis weekly at UCSD.

ARCS Award: The ARCS Foundation award further motivates me to make meaningful advances in chemical and biological science research. The award also encourages me to share my research with the scientific community.




UC San Diego


NOTICE
CLEAN AREA

BRYCE ERIC ACKERMANN

University of California San Diego

Division of Physical Sciences

Concentration: Biochemistry

Specialization: Structural Biology

Donor: Lambert Foundation for Education at Union Bank

Bryce studies the mechanisms of DNA compaction within human cells. He aims to describe the structure of the molecules involved in this process by developing the use of superconducting magnets to harness the innate magnetic properties of atoms. While genome sequencing has been extremely valuable, it is the 3-D structure of the genome that determines how DNA is expressed. The development of this technology will both provide insight into DNA organization and equip researchers with an unparalleled tool to study the molecular details of drugs and disease.

Degrees: M.S. in Chemistry, University of California San Diego; B.S. in Biochemistry and Molecular Biology, University of California Davis

Awards and Honors: Teddy Traylor Award 2020; EuroIsmar Conference Travel Award 2019; Biophysical Society Travel Award 2019; Molecular Biophysics Training Grant Fellowship 2018-2020

Publications, Papers, and Posters:

Lim, B.J.*; **Ackermann, B.E.***; Debelouchina, G.T. Targetable tetrazine-based dynamic nuclear polarization agents for biological systems. ChemBioChem 2020, 21 (9), 1315-1319. * signifies equal contribution

Ackermann, B.E.; Debelouchina, G.T. Heterochromatin protein HP1a gelation dynamics revealed by solid-state NMR spectroscopy. Angewandte Chemie International Edition 2019, 58 (19), 6300–6305

Monroy, B.Y.; Sawyer, D. L.; **Ackermann, B.E.**; Borden, M.M.; Tan, T. C.; Ori-McKenney, K.M. Competition between microtubule-associated proteins directs motor transport. Nature Communications 2018, 9 (1)

Gutierrez, P.A.; **Ackermann, B.E.**; Vershinin, M.; McKenney, R.J. Differential effects of the dynein-regulatory factor lissencephaly-1 on processive dynein-dynactin motility. Journal of Biological Chemistry 2017, 292 (29), 12245–12255

Current Research (expanded description): In the Debelouchina Lab at UCSD, our research is focused on elucidating the molecular architecture of heterochromatic regions in the mammalian genome. We focus on heterochromatin protein 1a, a major determinant of heterochromatin which has been proposed to form these regions via liquid-liquid phase separation. We use nuclear magnetic resonance spectroscopy to study these macromolecular complexes because of its unique ability to achieve atomic-scale structural information for heterogenous mixtures. Further, we implement dynamic nuclear polarization to enhance the signal sensitivity, an imperative tool to study these molecules at physiological concentrations within human cells. We aim to identify the molecular interactions of heterochromatin protein 1a, chromatin and additional chromatin effectors, as well as describe the dynamics and function of heterochromatic domains. Our goal is to provide the missing molecular glimpse into this enigmatic region within eukaryotic genomes. These results will set the precedent for structural biology within native environments and help fill the gap formed by the resolution limitations of microscopy.

Benefits to Science and Society: Research in the Debelouchina Lab has the dual benefit of developing new technology to achieve atomic resolution of molecules within cells and elucidating the structure of a genomic feature that is central to biology. Many diseases revolve around the abnormal structuring of macromolecules, and many drugs function by their interaction with these structures. We envision the use of this technology can help facilitate drug discovery and treatments by providing the complete molecular description of the targets in their complex cellular setting.

Personal Interests: I enjoy surfing, music, digital art, coffee, listening, and all things nature.

ARCS Award: I was filled with joy when I learned I received this award from the ARCS Foundation. It feels awesome to be recognized for the work I do and the passion I have for science and the community. It also reminds me to pass on recognition to my peers for years to come, for acknowledgement is a great gift that we can all share.

MIRIAM KATHLEEN BELL

University of California San Diego

Jacobs School of Engineering

Concentration: Mechanical Engineering

Specialization: Computational Neuroscience, Computational Biophysics

Donor: Reuben H. Fleet Foundation Fund

Miriam uses computational and mathematical tools to investigate the biophysics behind various biological phenomena in neurons and other cell lines. Most of her current projects focus on the shape-function relationship of dendritic spines, small protrusions on neurons that are centers of synaptic communication. Dendritic spines are known to have different shapes that are characteristic of aging, disease, and learning. Therefore, studying how these various shapes relate to dendritic spine and neuronal function provides valuable insight into underlying neural principles that can help combat various neurological diseases and conditions.

Degrees: M.S. in Mechanical Engineering, University of California San Diego; B.S. in Physics, Harvey Mudd College

Awards and Honors: NDSEG Fellowship 2018-2019; Interfaces Graduate Training Program NIH NIBIB T32 Fellowship 2018-2019; San Diego Match Fellowship 2017-2018; Competitive Edge Fellowship 2016

Publications, Papers, and Posters:

Calizo, R.*; **Bell, M.***; Ron, A.; Hu, M.; Bhattacharya, S.; Wong, N.; Janssen, W.; Perumal, G.; Pederson, P.; Scarlata, S.; Hone, J.; Azeloglu, E.; Rangamani, P.; Iyengar, R. Cell shape regulates subcellular organelle location to control early Ca2+ signal dynamics in vascular smooth muscle cells. Scientific Reports, 2020, 10(1), 1-17. *equal contribution

Pearce, K.M.*; **Bell, M.***; Linthicum, W.H.; Wen, Q.; Srinivasan, J.; Rangamani, P.; Scarlata, S. Gαq-mediated calcium dynamics and membrane tension modulate neurite plasticity. Molecular biology of the cell, 2020, 31(7), 683-694. *equal contribution

Bell, M.; Rangamani, P. Postsynaptic membrane voltage propagation depends on the geometry of the dendritic spine. 49th Annual Meeting of The Society for Neuroscience Conference, Chicago, IL, Oct 22, 2019

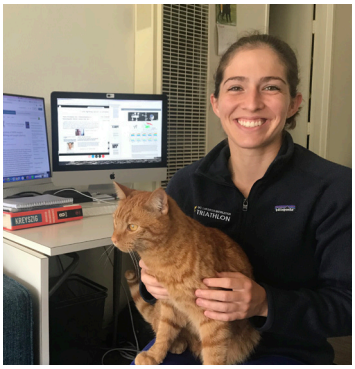
B**ell, M.**; Bartol, T.; Sejnowski, T.; Rangamani, P. Dendritic spine geometry and spine apparatus organization govern the spatiotemporal dynamics of calcium. Journal of General Physiology, 2019, 151(8), 1017-1034

Current Research (expanded description): In my research, I utilize systems of ordinary or partial differential equations (ODEs/PDEs) and mechanical models to consider the effects of biophysical properties on biological systems. The majority of my projects focus on the relationship between shape and function in dendritic spines. Dendritic spines are key centers of synaptic communication, plasticity, and signaling, with dynamics that propagate to determine overall neuronal behavior. Dendritic spines remain morphologically dynamic throughout their lifetimes and are known to have specific shapes characteristic to learning, aging, and disease. Most synapses are found on dendritic spines so the majority of synaptic transmission occurs through the activation of signaling pathways within these small volumes. Second messengers such as Ca^{2+} and IP_3 play vital roles in these pathways and their spatiotemporal dynamics determine downstream outcomes. Therefore, it is vital to understand the underlying biophysical properties of spines and how their shape and size influence their signaling networks and function. Overall, I use computational modeling to study multiscale systems or systems that have scales that make experimental observations challenging. I utilize both analytical and numerical approaches to study biological problems in order to offer insight, make predictions, and uncover fundamental principles.

Benefits to Science and Society: With billions of neurons and trillions of synaptic connections, the human brain is an engineering masterpiece. However, this complexity creates a vast number of complications that can arise if the brain malfunctions, which often occurs due to aging or traumatic brain injuries (TBI). Therefore, understanding how learning, memory formation, and decision-making occur in the brain is an important problem from both a scientific and societal point of view. Computational modeling can provide great insight into this complex system.

Personal Interests: Outside of lab, I enjoy playing soccer, bouldering, and hiking.

ARCS Award: Receiving the ARCS Foundation Award is a great privilege and opportunity for me. It allows me to pursue my research and develop as a scientist, with increased financial security and reduced anxiety. I greatly appreciate the ARCS Foundation for its support of and commitment to scientific research and individual scientists.



LAURA BROWN CHIPMAN

University of California San Diego

Division of Biological Sciences

Concentration: Biological Sciences

Specialization: RNA Regulation of Aging

Donor: Lambert Foundation for Education at Union Bank

Laura's research focuses on how aging is regulated on a molecular level. She studies how a small non-coding RNA molecule that is a fundamental regulator of gene expression, the microRNA, can regulate aging to increase or decrease lifespan. MicroRNAs act as the traffic cops of genetic information, with the ability to block gene expression. Laura wants to know how this regulation connects to organismal aging

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

Awards and Honors: National Science Foundation Graduate Research Fellow 2017; National Institute of Health Cell, Molecular, & Genetic Training Grant Affiliate 2016; University of Washington Husky Leadership 2014

Publications, Papers, and Posters:

Chipman, L.B.; Pasquinelli, A.E. MiRNA Targeting: Growing beyond the seed. Trends Genet. 2019, 35, 215–222

Aalto, A.P.; Nicastro, I.A.; Broughton, J.P.; **Chipman, L.B.**; Schreiner, W.P.; Chen, J.S.; Pasquinelli, A.E. Opposing roles of microRNA argonautes during caenorhabditis elegans aging. PLOS Genet. 2018, 14 (6), e1007379

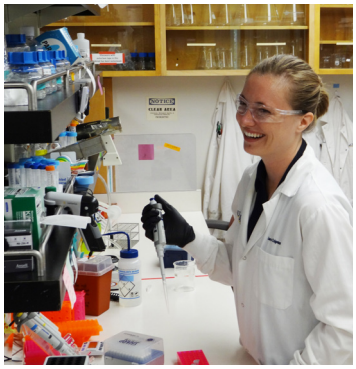
Lima, S.A.; **Chipman, L.B.**; Nicholson, A.L.; Chen, Y.-H.; Yee, B.A.; Yeo, G.W.; Coller, J.; Pasquinelli, A.E. Short poly(A) tails are a conserved feature of highly expressed genes. Nat. Struct. Mol. Biol. 2017, 24, 1057-1063

Current Research (expanded description): Argonaute (AGO) proteins partner with microRNAs (miRNAs) to target specific genes for post-transcriptional regulation. During larval development in Caenorhabditis elegans, Argonaute-Like Gene 1 (ALG-1) is the primary mediator of the miRNA pathway, while the related ALG-2 protein is largely dispensable. Our work shows that in adult C. elegans these AGOs are differentially expressed and, surprisingly, work in opposition to each other; alg-1 promotes longevity, whereas alg-2 restricts lifespan. Transcriptional profiling of adult animals revealed that distinct miRNAs and largely non-overlapping sets of protein-coding genes are misregulated in alg-1 and alg-2 mutants. Two miRNAs particularly of interest are lin-4 and miR-71; both of these miRNAs are specifically down-regulated in alg-1 mutant animals, loss of either miRNA results in a shortened lifespan, and potential target genes are up-regulated in alg-1 mutants. These miRNAs and some of the differentially expressed protein-coding genes act within the well-conserved Insulin/IGF-1 Signaling (IIS) pathway. Current studies are aimed at understanding how ALG-1 and ALG-2 associate with specific miRNAs and targets to differentially regulate organismal lifespan. This work establishes an important role for AGO-mediated miRNA gene regulation in aging C. elegans and illustrates that the activity of homologous genes can switch from complementary to antagonistic, depending on the life stage.

Benefits to Science and Society: MicroRNAs are involved in virtually every biological process, unsurprisingly; the mutation of specific microRNAs or the pathway has been implicated in multiple human diseases, from cancer, neurodegenerative diseases, to cardiovascular defects. My research will give deeper understanding of how microRNAs are regulated and regulate gene expression especially in the context of aging. Most diseases onset in aging, so understanding microRNAs in this context is vital for understanding and treating aging-related diseases.

Personal Interests: I enjoy running, swimming, hiking, anything that allows me to enjoy beautiful San Diego!

ARCS Award: In addition to introducing me to the bright and welcoming ARCS community, this award leaves me honored and alleviated of financial stress, allowing me to happily stay focused on my research!



GABRIELLE MARIE COLVERT

University of California San Diego

Jacobs School of Engineering

Concentration: Bioengineering

Specialization: Cardiovascular Imaging

Donor: Ellen Browning Scripps Foundation

The development of minimally invasive transcatheter procedures as alternatives to open-heart surgery demands new imaging techniques. Recent advances in noninvasive imaging have supported the success of these procedures by providing the exact size and location of cardiac pathologies and surrounding anatomy. Using noninvasive imaging, Gabrielle is developing novel methods for evaluating cardiovascular function beyond static anatomical measurements. These tools will improve diagnosis and prevention of cardiac events, enable patient stratification for transcatheter interventions, and yield new understanding of how diseases and implanted cardiac devices alter and restore normal function.

Degrees: M.S. in Bioengineering, University of California San Diego; B.S. in Biomedical Engineering, University of Southern California

Awards and Honors: Class of 2021 Siebel Scholar, NIH F31 NRSA Predoctoral Fellowship (F31HL151183) 2020-2023; RFW Best Student Paper Finalist, SPIE Medical Imaging 2019; NIH Integrative Bioengineering of Heart, Vessels, and Blood (T32HL105373) Training Grant Recipient 2017-2019; NAE Grand Challenges Scholar, USC 2016

Publications, Papers, and Posters:

Colvert, G.M.; Ortuño, J.E.; Bandettini, W.P.; Chen, M.Y.; Ledesma-Carbayo, M.J.; McVeigh, E.R. 4DCT-derived endocardial left ventricular torsion correlates with CMR tagging-derived torsion in the same subjects. JACC: Cardiovascular Imaging. July 2020; doi: 10.1016/j.jcmg.2020.05.022

Manohar, A.; **Colvert, G.M.**; Schluchter, A.; Contijoch, F.; McVeigh, E.R. Anthropomorphic left ventricular mesh phantom: a framework to investigate the accuracy of SQUEEZ using Coherent Point Drift for the detection of regional wall motion abnormalities. Journal of Medical Imaging. December 2019; doi: 10.1117/1.JMI.6.4.045001

Colvert, G.M.; Manohar, A.; Colvert, B.; Contijoch, F.; McVeigh, E.R. Measurement of left ventricular longitudinal and circumferential strain on the endocardial surface using 4DCT. 14th Annual Meeting of Society of Cardiovascular Computed Tomography, Baltimore, MD, July 2019

Colvert G.M.; Manohar, A.; Colvert, B.; Schluchter, A.; Contijoch, F.; McVeigh, E.R. Novel measurement of LV twist using 4DCT: Quantifying accuracy as a function of image noise. Medical Imaging 2019: Biomedical Applications in Molecular, Structural, and Functional Imaging, Proceedings of SPIE; Feb 2019; doi: 10.1117/12.2512532

Current Research (expanded description): The goals of my doctoral work are to leverage the advantages of 4D x-ray computed tomography (CT) to obtain highly reproducible metrics of cardiac function and evaluate their diagnostic and prognostic value in different patient populations. Specifically, I have chosen to focus on patients undergoing transcatheter-based interventions as I believe noninvasive imaging is an integral part of the success of procedures such as transcatheter mitral valve replacement (TMVR) and cardiac resynchronization therapy (CRT). Before entering the catheterization lab, physicians require information regarding both the anatomy and the functional state of their patient. With the tools I am working to develop, 4DCT can provide both anatomical and physiological information to improve the clinical outcomes of these interventions. More specifically, the goals of my research project are to obtain a better understanding of the effect of mitral regurgitation and TMVR on cardiac function and remodeling and to identify prognostic parameters which can be used to stratify patients for the procedure. In addition, we will use the tools I have developed to target the appropriate location for LV lead placement in CRT patients to decrease the number of non-responders (~33%) to the procedure.

Benefit to Science and Society: Through my research I plan to integrate imaging, physiology, biomechanics, and mathematical analyses for development of noninvasive measurements of cardiovascular function. In addition, I hope to make meaningful contributions to imaging science and interventional cardiology that enable a better scientific understanding of cardiovascular disease and improve clinical assessment and treatment of these diseases. Lastly, I would like to promote collaboration of interdisciplinary teams and encourage exchange of data and scientific discoveries to tackle highly complex health-related problems.

Personal Interests: I love travelling, hiking, and supporting my favorite sports teams (from the USC Trojans, to the Boston Celtics, to the Belgian Red Devils)!

ARCS Award: The ARCS award allows me to fully dedicate my time and effort in advancing my research project as well as my future career as an engineer instead of focusing on financial worries. In addition, this award has connected me to an inspiring, innovative, and supportive community which I am very grateful for.

BETHANNY PATRICIA DANSKIN

University of California San Diego

School of Medicine

Concentration: Neurosciences

Specialization: Systems Neuroscience

Donor: Hervey Family Non-Endowment Fund

Making a decision based on internal representation of value is a critical component of animal behavior, from a bee foraging between flower patches to complex human behaviors like economic choice or gambling. In interacting with the world, we need to weigh alternative choices with the expected value of outcomes. Bethanny's research uses cutting-edge neurobiological techniques to characterize the encoding of decision by neurons in the brains of awake, behaving mice.

Degrees: B.S. in Neurobiology, University of Washington; Associate of Arts and Sciences, Bellevue Community College

Awards and Honors: NIH NRSA F31 Individual Predoctoral Fellowship 2018; University of Washington President's Medal 2013; Mary Gates Research Scholarship 2013; Computational Neuroscience Training Grant 2012

Publications, Papers, and Posters:

Hattori, R.; **Danskin, B.D.**; Babic, Z.; Mlynaryk, N.; Komiyama, T. Area-specificity and plasticity of history-dependent value coding during learning. Cell 2019, 177, 1-15

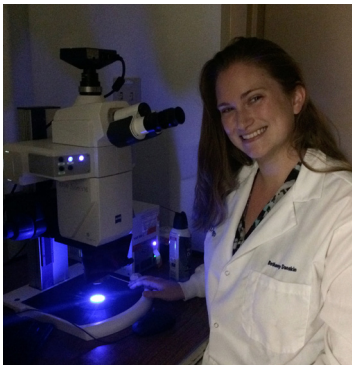
Hedrick, T; **Danskin, B.D.**; Larsen, R.S.; Ollerenshaw, D.; Groblewski, P.A.; Valley, M.; Olsen, S.; Waters; J. Characterization of channelrhodopsin and archaearhodopsin in cholinergic neurons of Cre-lox transgenic mice. PLoS One 2016, 11(5)e0156596

Danskin, B.D.; Denman, D.; Valley, M.; Ollerenshaw, D.; Williams, D.; Groblewski, P.A.; Reid, R.C.; Olsen, S.; Waters; J. Optogenetics in mice performing a visual discrimination task: measurement and elimination of retinal activation and the resulting behavioral artifact. PLoS One, 2015, 10(12):e0144760

Current Research (expanded description): I investigate the neural basis of value-based decision-making, which I study in cortical areas using a combination of calcium imaging, and optogenetic or pharmacological manipulations. I perform my experiments in awake and behaving mice, and model their behavior quantitatively, to better understand how decision information is encoded and used to make adaptive choices in a dynamic environment. Specifically, I have found that by briefly and precisely inactivating part of cortex called the Retrosplenial cortex (RSC) I can measurably degrade the encoding of value and impair the mouse's decision strategy both during and after optogenetic stimulation, which strongly implicates RSC as a repository maintaining value during the behavior.

Benefits to Science and Society: Integrating information to decide between several choices is a universal and critical precursor to animal behavior, one that relies on neural computations. Understanding the mechanisms underlying decision-making, especially the estimation and representation of a choice's value, is critical to effectively diagnosing and treating neuropathologies that affect decision-making. Such pathologies include frontotemporal dementia, Parkinson's disease, Huntington disease, and Alzheimer Disease. This research is also of interest for any field investigating how humans make complex decisions, such as economics or social sciences.

ARCS Award: The ARCS award is peace of mind and a great connection to talented and like-minded colleagues through the ARCS events. The award has lessened the financial burden of graduate school, and is allowing me to pursue my project to completion.



MICKEY FINN III

University of California San Diego

Jacobs School of Engineering

Concentration: NanoEngineering

Specialization: Organic Haptics

Donor: Reuben H. Fleet Foundation Fund

Current virtual reality environments grant ersatz immersion using display screens and speakers but tend to neglect the sense of touch. Mickey's current project utilizes dense arrays of microfabricated electrodes that are designed to be contacted by the finger pads and safely energized in ways that convey movement and/or surface texture. Previous work in electrotactile haptics employed fewer electrodes that were comparatively large with inadequate explanation of how people perceive them. Mickey intends to provide a more definitive understanding of this through human subject testing and statistical methods common in the biological sciences.

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

Honors and Awards: Illumina iAspire intern 2016; Tau Beta Pi 2014; Warren College Honors Society 2013-2016; UCSD Provost Honors 2013-2016

Publications, Papers, and Posters:

Keef, C.V.; Kayser, L.V.; Tronboll, S.; Carpenter, C.W.; Root, N.B.; **Finn, M.**; O'Connor, T.F.; Abuhamdieh, S.N.; Davies, D.M.; Lipomi, D.J. Virtual texture generated using elastomeric conductive block copolymer in a wireless multimodal haptic glove. Adv. Intell. Syst. 2020, 2 (4), 2000018

Finn, M.; Treiber, J.; Issa, M.; Martens, C.J.; Feeney, C.P.; Ngwa, L.; Dhong, C.; Lipomi, D.J. Survival of polymeric microstructures subjected to interrogatory touch. (2020, submitted)

Dhong, C.; Kayser, L.V; Arroyo, R.; Shin, A.; **Finn, M.**; Kleinschmidt, A.T.; Lipomi, D.J. Role of fingerprint-inspired relief structures in elastomeric slabs for detecting frictional differences arising from surface monolayers. Soft Matter 2018, 14 (36), 7483–7491

Finn, M.; Martens, C.J.; Zaretski, A.V.; Roth, B.; Søndergaard, R.R.; Krebs, F.C.; Lipomi, D.J. Mechanical stability of roll-to-roll printed solar cells under cyclic bending and torsion. Sol. Energy Mater. Sol. Cells 2018, 174 (August 2017), 7–15

Current Research (expanded description): For the remainder of graduate school, I plan to leverage my work with electrotactiles in my current project along with my work in micropillars arrays in my previous project. An obvious culmination of these two approaches to haptic actuation would be to fabricate polymeric microstructures with embedded magnetic nanoparticles to make a haptic actuator that can move in response to fields generated by electromagnets. Based on my review of the existing literature and exposure to stimuli-responsive magnetic materials (and other less promising stimuli-responsive materials) at conferences, I have determined that this is the most promising route towards realizing a configurable haptic display surface with the necessary repeatability, response speed and actuation force to convey switchable touch sensations. As time allows, I ultimately wish to integrate such magnetically-enhanced polymer actuators, along with other sensors and actuators developed by colleagues in my research group, into a next generation haptic glove platform such as that which we recently produced for the publication under preparation.

Benefits to Science and Society: The continued commercial development of Virtual Reality and Augmented Reality systems provides sufficient motivation for technologies that can provide a more immersive user experience. Increasingly realistic haptic feedback and actuation, however, can also enable remote surgery and virtual training that would otherwise be either hazardous or cost-prohibitive. Haptic feedback has been shown to be of therapeutic value for both infants born prematurely and victims of stroke. Novel reconfigurable surfaces developed for haptics can also benefit the humanities as tactile art.

Personal Interests: Recreational reading, playing guitar/songwriting, woodworking, 3D printing, hobby electronics, exercise (cycling, swimming, etc.)

ARCS Award: It is a great honor to me because it validates all the hard work and long hours. Additionally, my financial affairs are currently not in the best shape so the monetary disbursement will provide much-needed relief that will allow me to focus more on my work.

MARK KALAJ

University of California San Diego

Division of Physical Sciences

Concentration: Chemistry

Specialization: Materials and Inorganic Chemistry

Donor: Virginia Lynch Grady Endowment

Mark's work focuses on the design of materials that protect soldiers and civilians from chemical warfare agents. Current materials used to protect soldiers from these harmful chemicals involve porous carbons that function simply as adsorbents. Mark's work is concentrated on designing novel materials that can chemically degrade chemical warfare agents and adsorb them. The materials being used in his research are inherently crystalline solids known as metal-organic frameworks. Mark's work also centers on tailoring these solid materials with flexible polymers for their incorporation in protective textile fibers.

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

Awards and Honors: 2020 ACS Division of Inorganic Chemistry Travel Award 2020; ARCS Award 2019, 2020; Teddy G. Traylor Award 2019; National Defense Science and Engineering Graduate Fellowship 2018

Publications, Paper, and Posters:

Kalaj, M.; Cohen, S.M. Spray coating of catalytically active MOF-polythiourea through postsynthetic polymerization. Angew. Chem., Int. Ed. 2020, 59, 13984-13989

Kalaj, M.; Cohen, S.M. Postsynthetic modification: An enabling technology for the advancement of metal-organic frameworks. ACS Cent. Sci. 2020, 6, 1046-1057

Kalaj, M.; Bentz, K.C.; Ayala Jr., S.; Palomba, J.M.; Barcus, K.S.; Katayama, Y.; Cohen, S.M. MOF-polymer hybrid materials: From simple composites to tailored architectures. Chem. Rev. 2020, 120, 8267-8302

Kalaj, M.; Denny Jr., M.S.; Bentz, K.C.; Palomba, J.M.; Cohen, S.M. Nylon-MOF composites through postsynthetic polymerization. Angew. Chem., Int. Ed. 2019, 58, 2336-2340

Current Research (expanded description): Mark's research is focused on the use of metal-organic frameworks for the catalytic degradation of organophosphorous chemical warfare agents. Metal-organic frameworks are constructed from inorganic metal nodes, termed secondary building units, joined together by multitopic organic linkers. Mark has incorporated various functional groups (amine, hydroxy, halogen, etc.) on the organic linkers of the metal-organic frameworks to improve their catalytic properties. Metal-organic frameworks, however, are inherently crystalline materials and are synthesized in powder form. Mark's research has also focused on hybridizing these solid frameworks with soft polymers to design a composite material that contains both the catalytic properties of the metal-organic frameworks as well as the flexibility properties of the polymer. This is significant for the incorporation of metal-organic frameworks into a more applicable form factor. To design materials for the protection of soldiers and civilians it is important to select polymers that are commonly used in textiles. With this in mind, Mark designed a flexible metal-organic framework Nylon hybrid material with the ability to degrade CWAs. In this approach, he used interfacial polymerization to covalently tether Nylon polymers to metal-organic framework polythiourea hybrid material with the ability to degrade CWAs. These materials also showed catalytic ability and adhesiveness when spray coated onto textile based fibers.

Benefits to Science and Society: Despite decades of diplomatic work around the globe for the prohibition of their use, chemical warfare agents remain a danger. Mark's research is concentrated on the synthesis of novel materials that are excellent for the catalytic degradation of chemical warfare agents. Achievement of these materials, at a reasonable cost, would significantly help protect civilians and soldiers who reside in areas where chemical warfare agents are a potential threat.

Personal Interests: In his spare time, Mark enjoys traveling and playing sports. He is also a big Detroit sports fan, go Lions!

ARCS Award: I am honored to be named an ARCS Foundation Scholar this year. I cannot express enough my gratitude to the ARCS Foundation for their support over the last year and I am excited to be a Scholar this year as well. I am proud to be associated with such a commendable foundation with a great mission. I hope that one day I can make the ARCS Foundation as proud to be associated with me as I am to be associated with you.

KEVIN RICHARD KAUFMANN

University of California San Diego

Jacobs School of Engineering

Concentration: NanoEngineering

Specialization: Machine Learning

Donor: Timkin-Sturgis Foundation

Kevin is researching the application of artificial intelligence to material design, discovery, and analysis. His research efforts are reducing the time and money spent searching for materials with enhanced properties by aiding researchers in selecting the best candidate elemental compositions. After synthesizing these candidates, complete characterization is the next hurdle in material development. Kevin is developing advanced machine learning algorithms capable of characterizing many aspects of the material with little to no a priori knowledge required.

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

Awards and Honors: Abe Hurlich Scholarship - ASM San Diego 2018; National Defense Science and Engineering Graduate (NDSEG) Fellowship 2017 - Present; National Science Foundation (NSF) GRFP Recipient 2017; Jacobs School of Engineering Art Contest 2017

Publications, Papers, and Posters:

Kaufmann, K.; Zhu, C.; Rosengarten, A.S.; Vecchio, K.S. Deep neural network enabled space group identification in EBSD. Microscopy and Microanalysis 2020, 26, 447-457

Kaufmann, K.; Zhu, C.; Rosengarten, A.S.; Maryanovsky, D.; Wang, H.; Vecchio, K.S. Phase mapping in EBSD using convolutional neural networks. Microscopy and Microanalysis 2020, 26, 458-468

Kaufmann, K.; Maryanovsky, D.; Mellor, W.M.; Zhu, C.; Rosengarten, A.S.; Harrington, T.J.; Oses, C.; Toher, C.; Curtarolo, S.; Vecchio, K.S. Discovery of high-entropy ceramics via machine learning. Npj Computational Materials 2020, 6, 1-9

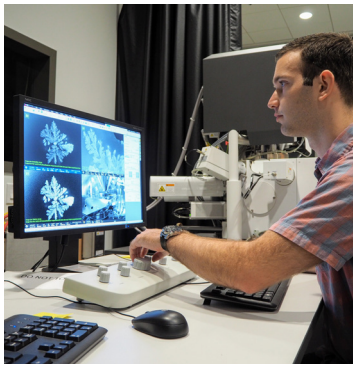
Kaufmann, K.; Zhu, C.; Rosengarten, A.S.; Maryanovsky, D.; Harrington, T.J.; Marin, E.; Vecchio, K.S. Crystal symmetry determination in electron diffraction using machine learning. Science 2020, 367, 564-568

Current Research (expanded description): I am currently leading projects in the field of applied data science and machine learning with a focus on material discovery and sample analysis. The primary goal of the work is to enable computers to 'learn' microstructure data, including phase identification combining chemistry (EDS) and electron backscatter diffraction (EBSD) data, phase fractions, phase location, phase morphology, etc., that enables complete microstructure quantification in an autonomous mode. The secondary goal is to teach the computer to aid in the selection of promising new materials from extremely large computational databases given a set of desired properties and constraints. I am also working to combine these capabilities with our additive manufacturing equipment to create a high-throughput design loop. These machine- learning enabled capabilities represent my unique approach to high-throughput material synthesis and analysis, which would significantly accelerate new material development.

Benefits to Science and Society: Kevin's machine learning endeavors are laying the foundation for autonomous material selection and characterization. If successful, new materials could be designed and evaluated in a fraction of the time it currently takes to investigate one new material. If successfully incorporated into a high-throughput approach, it could open the door to highly automated research facilities.

Personal Interests: Fishing, numismatics.

ARCS Award: The ARCS Foundation Award is both recognition of your accomplishments and an opportunity to share your work with the community.



ANDREW THOMAS KLEINSCHMIDT

University of California San Diego

Jacobs School of Engineering

Concentration: Chemical Engineering

Specialization: Materials Simulation and Design

Donor: Laura Mateo/Lakeside Foundation / ARCS Foundation – San Diego

Andrew's research focuses on modeling special types of plastics which can be used for solar cells and other electronic materials. These plastics could be used to create affordable solar cells soft enough to be worn on human skin or hard enough to be embedded into roadways. By modeling these materials, their electronic and mechanical behavior can be predicted before testing, allowing for more rapid technological advances.

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

Awards and Honors: Powell Fellowship 2016-2017 (one year fellowship at UCSD); Katzin Prize 2016 (for incoming UCSD graduate students)

Publications, Papers, and Posters:

Kleinschmidt, A.T.; Lipomi, D.J. Stretchable conjugated polymers: A case study for new research groups. Acc. Chem. Res. 2018, 51, 3134

Sugiyama, F.; **Kleinschmidt, A.T.**; Kayser, L.V.; Rodriquez, D.; Finn, M.; Alkhandra, M.; Wan, J.M.-H.; Ramirez, J.; Chiang, A.S-C.; Root, S.; Savagatrup, S.; Lipomi, D.J. Effects of flexibility and branching of side chains on the mechanical properties of low-bandgap conjugated polymers. Polym. Chem. 2018, 9, 4354

Sugiyama, F.; **Kleinschmidt, A.T.**; Kayser, L.V.; Alkhandra, M.A.; Wan, J.-H.; Chiang, A.S-C.; Rodriquez, D.; Root, S.E.; Savagatrup, S.; Lipomi, D.J. Stretchable and degrading semiconducting block copolymers. Macromolecules 2018, 51, 5944

Kleinschmidt, A.T.; Root, S.E.; Lipomi, D.J. Poly (3-hexylthiophene) (P3HT): Fruit fly or outlier in organic solar cell research? J. Mater. Chem. A 2017, 5, 11396

Current Research (expanded description): My research focuses on computational molecular-scale modeling of conjugated polymers. I use molecular dynamics simulations to model how polymer chains move past each other to predict their mechanical properties (and to model morphologies which could be used to predict electronic properties). My research has two main subprojects. First, I use quantum chemical calculations to properly parameterize my molecular dynamics simulations. In particular, my research includes important corrections to backbone rigidity specific to conjugated polymers. Secondly, I use advanced sampling techniques to "speed up" my molecular dynamics simulations in order to observe and analyze long time-scale events (i.e. chain folding). I plan to use this research to apply for postdocs and eventually academic faculty positions.

Benefits to Science and Society: The main benefit of my research is developing affordable, versatile solar cells that can be placed on any surface imaginable. Because the solar cells I develop are made from plastic, they can be made soft and stretchable to provide constant power to wearable devices (such as advanced biosensors). Alternatively, these solar cells could be made tough and durable to act as car paint or window coatings. Finally, because these materials are made of plastic, they can be produced very cheaply and conformally coat a wide variety of surfaces.

Personal Interests: I volunteer with an afterschool program to tutor at-risk high schoolers called Reality Changers.

ARCS Award: The ARCS Foundation award helps me feel connected to the community and helps me feel like my scientific endeavors are appreciated even on days when the work feels thankless. The enthusiasm of ARCS members for learning about and supporting cutting-edge research helps me feel that my work is of value to the broader community which supports it. Additionally, the financial benefit of ARCS has allowed me to attend more conferences to build out my scholarly network.

JENNA JOAQUIN LAWRENCE

University of California San Diego

Jacobs School of Engineering

Concentration: Mechanical and Aerospace Engineering

Specialization: Biological Fluid Mechanics

Donor: Wally Schirra Memorial Endowment

Jenna studies the flow of cerebrospinal fluid in the central nervous system, both the overall flow characteristics and the small-scale features of the flow. She uses a combination of theoretical fluid mechanics, numerical simulations, and magnetic resonance imaging to investigate these flows. These results help inform her work on intrathecal drug delivery, in which medication is injected to the lumbar region of the spinal canal with the intent of delivering the medication to locations along the spinal canal or to the brain.

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

Awards and Honors: Outstanding Teaching Assistant Award, Mechanical and Aerospace Engineering, UC San Diego, June 2019

Publications, Papers, and Posters:

Lawrence, J.J.; Coenen, W.; Sánchez, A.L.; Pawlak, G.; Martínez-Bazán, C.; Haughton, V.; Lasheras, J.C. On the dispersion of a drug delivered intrathecally in the spinal canal. Journal of Fluid Mechanics 2019, 861, 679–720

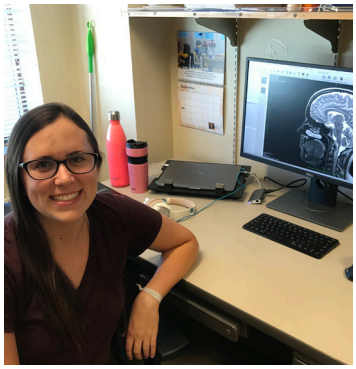
Guiérrez-Montes, C.; Coenen, W.; **Lawrence, J.J.**; Martínez-Bazán, C.; Haughton, V.; Lasheras, J.C. Modelling and direct numerical simulation of flow and solute dispersion in the spinal subarachnoid space. Applied Mathematical Modelling (in review)

Current Research (expanded description): My research thus far has considered the theoretical fluid mechanics of cerebrospinal fluid in the spinal canal. The driving force of this flow is the periodic, pulsatile pressure in the brain due to the heartbeat which induces a small motion at the entrance of the spinal canal. This motion is transmitted throughout the entire spinal canal and the cumulative convective effects over many heartbeats cause a long-term bulk motion. This bulk motion explains the various experimental results which suggest that a tracer injected in the lumbar region reaches the brain in about thirty minutes, and vice versa. We are currently expanding our simple theory in a number of ways by considering more realistic model geometries, the effects of buoyancy, the effects of nonharmonic pressure variation in the brain, and the effects of microanatomy. We are also beginning to use magnetic resonance imaging to gather flowrate data of both cerebrospinal fluid and blood in the brain and along the spinal canal. We hope to use this flowrate data in combination with subject-specific geometry and physiological data to further refine our models.

Benefits to Science and Society: It is currently difficult to predict how a drug administered to the lumbar region will travel through the cerebrospinal fluid. To avoid the negative side effects associated with over-dosing, drugs injected intrathecally are frequently under-dosed, reducing their efficacy. We hope to use patient-specific geometry and physiological information to better predict how a drug will disperse in the cerebrospinal fluid which will improve suggested dosing and therefore improve patient outcomes.

Personal Interests: In her free time, Jenna enjoys yoga, reading, and videogames.

ARCS Award: I am exceptionally grateful for the support of the ARCS Foundation. It is an honor to be part of an organization that so highly values scientific advancement.



CHI-WEI MAN

University of California San Diego

Division of Physical Sciences

Concentration: Biochemistry

Specialization: Immunotherapy

Donor: Kathryn Crippen Hattox Endowment

Chi-Wei's research focuses on using molecular and cellular engineering to enhance cells to better fight cancer. Immunotherapy is a technique which has gained popularity over the past couple of years due to its success in combating blood-borne cancers such as leukemia; however, immunotherapy still struggles with eradicating solid tumors. One reason for this is the immunosuppressive microenvironment of the tumor. Chi-Wei uses a technique called directed evolution to engineer novel proteins to help immunotherapies remain active in tumor microenvironments and enhance their efficacy.

Degrees: M.S. in Chemistry and Biochemistry, University of California San Diego; B.A. in Biochemistry, University of Pennsylvania; B.S.E in Chemical Biomolecular Engineering, University of Pennsylvania

Awards and Honors: Interfaces Training Grant Awardee 2016; Vagelos Scholar in Molecular Life Sciences 2015; Sanofi Aventis Chemistry Scholarship 2011; Columbia Science Honors program 2010

Publications, Papers, and Posters:

Limsakul, P.; **Man, C.W**.; Peng, Q.; Lu, S.; Wang, Y. Development of novel cellular imaging tools using protein engineering. Protein Engineering: Tools and Applications. [Online] 2020 https://www.wiley.com/en-us/Protein+Engineering%3A+Tools+and+Applications-p-9783527344703 (accessed September 4, 2018). To be published in 2020 by Wiley

Man, C.W.; Harrison, R.; Peng, Q.; Limsakul, P.; Wang, Y. A PDL1-targeting CAR designed via directed evolution. Poster, BMES Conference, 2019, Philadelphia PA

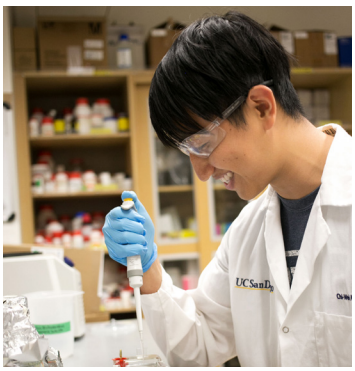
Pujari, A.; **Man, C.W.**; Park, J. T-Cell manufacture for treatment of acute lymphoblastic leukemia. Undergraduate Research Commons. [Online] 2015, 75, 1-201. http://repository.upenn.edu/cbe_sdr/75 (accessed September 4, 2018)

Current Research (expanded description): Currently I am focusing on two main projects. The first project is to engineer a protein scaffold to better bind to Programmed Death-Ligand 1.To achieve this goal, I use site-saturated mutagenesis to generate a DNA library. I transform this into yeast cells and screen these cells for enhanced PD-L1 binding. The first round of screening has already been finished, and we have identified a protein with enhanced PD-L1 binding. I have tested this protein in Chimeric Antigen Receptors and demonstrated enhanced T-cell activation using our enhanced protein scaffold. My second project uses the SynNotch system developed by Dr. Wendell Lim from Stanford University. I have developed a unique method to use this SynNotch system as a negative feedback regulator of Chimeric Antigen Receptor T-cells (CAR-T cells). The purpose of this will be to reduce the side effects of CAR-T cells such as cytokine release syndrome which have proven to be fatal in a significant number of patients.

Benefits to Science and Society: Immunotherapies currently have difficulty treating solid tumors due to their suppressive microenvironment. My research would provide physicians with novel immunotherapies that would be more resistant to the suppressive tumor microenvironment and more controllable. This would greatly improve the reach of immunotherapies which currently struggle with treating solid tumors. My project also focuses on minimizing the deleterious side effects of immunotherapies. With my technology, immunotherapies should be safer to use in patients.

Personal Interests: I'm an avid tennis player (team won USTA national championships in 2011). I also enjoy reading, playing piano, and guitar.

ARCS Award: The ARCS Foundation award means a lot to me because it provides funds that help me to remain financially stable as I work on my PhD. The award gives me the peace of mind to be able to focus on my research and the financial ability to live 2 miles from campus. Especially during these tough times, I greatly appreciate being able to bike to campus and avoid potential COVID infection.



RYAN JARED MARINA

University of California San Diego

School of Medicine

Concentration: Biomedical Sciences

Specialization: Genetics and Genomics

Donor: LaVerne Briggs

Ryan's research project aims to understand the underlying molecular mechanisms of the neurodegenerative disease Amyotrophic Lateral Sclerosis (ALS). Trained as an RNA biologist, Ryan is seeking to identify how mutations within a particular class of proteins, called RNA-binding proteins (RBPs), contribute to disease susceptibility later in life. His research revolves around using a combination of induced pluripotent stem cell (iPSC) technologies and bioinformatic approaches to determine causative pathways contributing to neuron degeneration.

Degree: B.S. in Cellular and Molecular Biology, University of Michigan

Awards and Honors: Ruth L. Kirschstein National Research Service Award (F31), NINDS/NIH; NIGMS Training Grant (T32 GM008666) University of California San Diego; Graduate Research Fellowship Program Honorable Mention, National Science Foundation

Publications, Papers, and Posters:

Marina, R.J.; Brannan, K.W.; Dong, KD; Yee, B.A.; Yeo, G.W. Evaluation of engineered CRISPR-Cas-mediated systems for site-specific RNA editing. Cell Reports 2020, 33(5), 108350

Batra, R; Nelles, D.A.; Pirie, E.; Blue, S.M.; **Marina, R.J.**; Wang, H.; Chaim, I.A.; Thomas, J.D.; Zhang, N.; Nguyen, V.; Aigner, S.; Markmiller, S.; Cooper, T.A.; Xia, G.; Corbett, K.D.; Swanson M.S.; Yeo, G.W. Visualization and elimination of toxic microsatellite expansion RNA by RNA-targeting Cas9. Cell 2017, 170, 899-912

Diao, Y.; Fang, R.; Li, B.; Meng, Z.; Yu, J.; Qiu, Y; Lin, K.C.; Huang, H.; Liu, T.; **Marina, R.J.**; Jung, I.; Shen, Y.; Guan, K.; Ren, B. A tiling-deletion based genetic screen for cis-regulatory element identification in mammalian cells. Nat Methods 2017, 14, 629-635

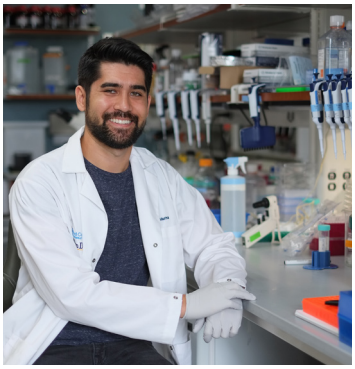
Marina, R.J.; Sturgill, D.; Bailly, M.A.; Thenoz, M.; Varma, G.; Prigge, M.F.; Nanan, K.K.; Shukla, S.; Haque, N.; Oberdoerffer, S. TET-catalyzed oxidation of intragenic 5-methylcytosine regulates CTCF-dependent alternative splicing. EMBO J 2016, 35, 335-355

Current Research (expanded description): RNA-binding proteins play integral roles in mediating cellular functions through post-transcriptional gene regulation. RNA-binding protein dysregulation is implicated in several human diseases and is recurrent in neurodegenerative disorders such as amyotrophic lateral sclerosis (ALS). ALS is a paralyzing and incurable disease characterized by upper and lower motor neuron degeneration, progressive muscle wasting and eventual death. Though the causes of ALS are predominantly unknown, with 90% of cases occurring sporadically, patient neurons exhibit distinct hallmarks including aberrant RNA-binding protein biology. My research seeks to understand how a particular RNA binding protein, ataxin-2, contributes to motor neuron degeneration. Ataxin-2 is expressed in every tissue of the human body, yet mutations in this gene specifically manifest in devastating neurodegenerative phenotypes. Using molecular techniques, human stem cell models, and bioinformatic tools, I hope to discern the regulatory pathways downstream of ataxin-2 that are responsible for causing disease state. Moreover, in identifying these pathways, I hope to uncover additional therapeutic avenues or targets that might prove useful in treating all forms of ALS.

Benefits to Science and Society: ALS is the most common motor neuron disease in the adult population that manifests through muscle atrophy, loss of voluntary motor activity, and death in those afflicted. Although pathology of ALS is well characterized, the causative factors responsible for disease onset remain elusive. Through my research I hope to characterize the regulatory roles of RNA-binding proteins in the context of neuronal physiology and disease and strive to use relevant disease modeling strategies to uncover potential therapeutic targets for ALS pathogenesis.

Personal Interests: In my spare time outside of lab, I enjoy cooking, exercising, playing my cello, and hiking with friends.

ARCS Award: I am incredibly grateful to have the continued support of the ARCS Foundation and its members. As a returning scholar, I have been exposed to the generosity and passion of ARCS Foundation, whose members genuinely encourage the continued advancement and success of each of their scholars. This award not only provides me with extremely generous financial support during my graduate training, but also serves as assurance that members of the community truly value the importance of science education and research.



NICOLE PATRICIA MLYNARYK

University of California San Diego

School of Medicine

Concentration: Neurosciences

Specialization: Systems Neuroscience

Donor: Toby Eisenberg

When faced with a decision, we often compare the value of each option and then choose the one that seems most rewarding. Keeping track of value information is very important, but how the brain actually does this remains unclear. To study this, Nicole records the activity of thousands of neurons in a mouse's brain while the animal performs a decision-making task. Using circuit tracing techniques, she can identify the specific neural pathways that encode value, and observe how they communicate with other brain areas to guide our choices.

Degree: B.A. in Cell Biology and Neuroscience, Rutgers University

Awards and Honors: UCSD Quantitative Integrative Biology Fellowship; NIH Intramural Research Training Award; Aresty Undergraduate Research Fellowship; Amgen Scholar Award

Publications, Papers, and Posters:

Hattori, R.; Danskin, B.; Babic, Z.; **Mlynaryk, N.**; Komiyama, T. Area-specificity and plasticity of history-dependent value coding during learning. Cell. 2019, 177(7), 1858-1872

McGowan, H.; Mirabella, V.R.; Hamod, A.; Karakhanyan, A.; **Mlynaryk, N.**; Moore, J.C.; Tischfield, J.A.; Hart, R.P.; Pang, Z.P. hsa-let-7c miRNA regulates synaptic and neuronal function in human neurons. Frontiers in Synaptic Neuroscience. 2018, 10, 19

Zhang, X; **Mlynaryk, N.**; Ahmed, S.; Japee, S.; Ungerleider, L.G. The role of inferior frontal junction in controlling the spatially global effect of feature-based attention in human visual areas. PLOS Biology. 2018, 16, 6

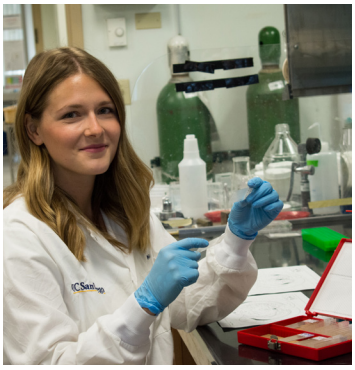
Zhang, X.; **Mlynaryk, N.**; Japee, S.; Ungerleider, L.G. Attentional selection of multiple objects in the human visual system. NeuroImage. 2017, 163, 231-243

Current Research (expanded description): Value-based decision making is a process in which we assign subjective values to each of our options and then choose the one we believe will be most rewarding. Knowing how the brain computes, stores, and uses this value information is important to understanding both healthy and impaired decision making. Recent work in the Komiyama Lab has identified the retrosplenial cortex (RSC) as a critical brain region where value information is strongly and persistently encoded. My central goals are to identify how these representations of value arise within RSC, and which other brain region(s) RSC then sends this information to. To do this, I use two-photon calcium imaging to record the activity of thousands of neurons in the brain of a mouse while it performs a decision-making task. By combining this technology with computational modeling and advanced circuit tracing techniques, I can track how value information flows throughout the brain and guides an animal's decisions. I will also use optogenetic tools to shut down specific neural pathways and see how that changes the animal's decision-making strategy. This work will reveal the role of RSC within the brain's larger decision-making network, and help us understand the neurobiology of making good choices.

Benefits to Science and Society: Decision making is a fundamental behavior critical to many animal species, and yet much about its neural mechanism remains unknown. By understanding how the brain guides us towards rewarding choices, we can better diagnose and treat disorders in which decision making is impaired, such as Parkinson's disease, Alzheimer's disease, addiction and depression. These insights will also improve theories in the fields of economics, computer science, and social sciences, where decision making is also relevant.

Personal Interests: When not in lab, I also enjoy camping, cooking, gardening, going to concerts, and long road trips.

ARCS Award: Being selected for this award was a wonderful validation of the work I've done so far and gives me the financial stability to take care of myself and focus my energy on my scientific goals.



COLMAN ARTHUR MOORE

University of California San Diego

Jacobs School of Engineering

Concentration: NanoEngineering

Specialization: Molecular Imaging

Donor: Donald C. and Elizabeth M. Dickinson Foundation

Colman studies the intersection of nanoengineering and biomedical imaging to develop new strategies for probing disease. He is currently focused on applications in which therapeutic progress has been slow, such as Alzheimer's disease and periodontal disease. In both cases, pathogenesis is not well-defined and pre-symptomatic detection is difficult. He is currently developing a pathogen-sensitive imaging agent for ultrasound-based imaging of periodontal disease. In tandem, he is applying a novel analytical technique for measuring the nanoscale size distributions of self-aggregating proteins, research that has implications for a variety of neurodegenerative disorders.

Degrees: M.S. in NanoEngineering, University of California San Diego; B.S. in Biomedical Engineering, University of South Carolina

Awards and Honors: NSF Graduate Research Fellow 2019-present; NIH T32 Training Grant Recipient 2018-2019; UCSD Powell Foundation Fellow 2017-2018; Travel Grant, AIMBE Public Policy Institute 2018

Publications, Papers, and Posters:

Moore, C.; Wing, R.; Pham, T.; Jokerst, J.V. Multispectral nanoparticle tracking analysis for the real-time and label free characterization of amyloid-β self-assembly in vitro. Analytical Chemistry 2020, 92(17), 11590-11599

Moore, C.; Chen, F.; Wang, J.; Jokerst, J.V. Listening for the therapeutic window: Advances in drug delivery utilizing photoacoustic imaging. Advanced Drug Delivery Reviews 2019, 144, 78-89

Moore, C.; Jokerst, J.V. Strategies for image-guided therapy, surgery, and drug delivery using photoacoustic imaging. Theranostics 2019, 9 (6), 1550-1571

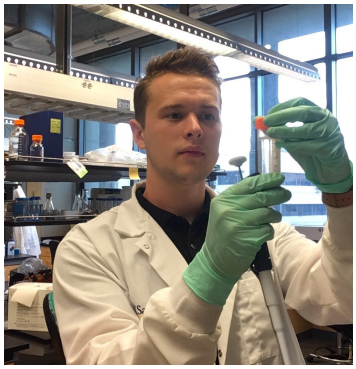
Moore, C.; Bai, Y.; Hariri, A.; Sanchez, J.B.; Lin, C.-Y.; Koka, S.; Sedghizadeh, P.; Chen, C.; Jokerst, J.V. Photoacoustic imaging for monitoring periodontal health: A first human study. Photoacoustics 2018, 12, 67-74

Current Research (expanded description): The current objective of my research is to synthesize an activatable contrast agent to map and measure gingipains expressed by Porphyromonas gingivalis, a pathogenic bacterium, with photoacoustic ultrasound. While P. gingivalis can be quantified in the lab with PCR, it cannot be done so chairside. Molecular imaging with ultrasound offers data that is real-time, chairside, and molecularly specific—it can report the quantity and location of the periodontal pathogen with utility in diagnosis and therapy monitoring. We are motivated by studies showing that dental pain dramatically decreases quality of life but that nearly 50% of Americans have some form of periodontitis. Current approaches to monitoring oral health only measure the downstream symptoms of periodontitis (tooth loss, pocket depth, etc.). By imaging and measuring a molecular marker of disease, new insights can be gained into its basic biology as well as lead to better diagnostic and treatment-monitoring plans. Secondary objectives of this work are to miniaturize photoacoustic hardware for more practical use in the oral cavity, implement reconstruction algorithms for handheld imaging, and harness endogenous contrast mechanisms to also image inflammation and anatomical features of the periodontium using a single platform.

Benefits to Science and Society: Oral health is a critical component of quality of life, but the tools that clinicians use to inspect the oral cavity only monitor the effects and symptoms of periodontitis rather than the underlying cause. The current goal of this work is to synthesize an imaging agent that generates photoacoustic signal when it encounters dangerous bacteria in the subgingival sulcus. This will identify periodontal disease earlier and more accurately while providing clinicians with molecular-level insight to help better direct care and improve quality of life.

Personal Interests: Outside of the lab, I enjoy playing tennis, hiking, and collecting records.

ARCS Award: The ARCS award has reaffirmed my dedication to impactful research and has further motivated me to be as productive as I can during graduate school. I am also grateful for its alleviation of many of the financial pressures associated with Ph.D. training.



JESSICA YI-JUN NG

University of California San Diego

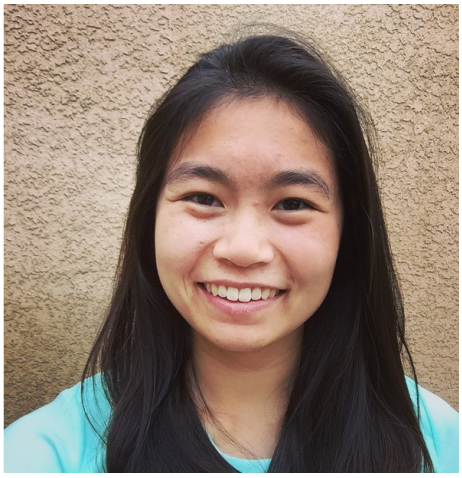
Scripps Institution of Oceanography

Concentration: Geochemistry

Specialization: Noble gas paleoclimatology

Donor: Sharon and Carlos Arbelaez

Jessica's research project is in the Andean Highlands of Chile and Argentina, where lithium mining for electric vehicle batteries and other renewable energy technologies is stressing extremely limited water resources. She measures gases dissolved in the groundwater—water that rained or snowed thousands of years ago and accumulated in closed basins—to understand how the level of groundwater has changed over time, with the goal of quantifying the impact of recent lithium mining.



Degrees: M.S. in Climate Sciences, University of California San Diego; B.A. in Physics, Scripps College

Awards and Honors: National Geographic Explorers Grant; Lal Fellowship (SIO); International Institute Travel Research Grant (UCSD); Center for Iberian and Latin American Studies Travel Grant (UCSD)

Publications, Papers, and Posters:

Seltzer, A.; **Ng, J.**; Severinghaus, J. Precise determination of Ar, Kr and Xe isotopic fractionation due to diffusion and dissolution in fresh water. Earth and Planetary Science Letters 2019, 514, 156-165

Ng, J.; Severinghaus, J.; Bay, R. Predicting the optical signal in Oldest Ice using marine dust records. POLAR2018, 2018, poster, Davos, CH

Yan, Y.; Bender, M.; Brook, E.; Clifford, H.; Kemeny, P.; Kurbatov, A.; Mackay, S.; Mayewski, P.; **Ng, J.**; Severinghaus, J.; Higgins, J. 2-million year old climate snapshots from shallow ice cores in the Allan Hills, Antarctica. (In review, Nature)

Ng, J.; Williams, B.; Thompson, D.M.; Mayne, C.; Halfar, J.; Edinger, E.N.; Johnson, K.R. Assessing multi-site δ18O-climate calibrations of the coralline alga clathromorphum across the high-latitude Northern Hemisphere. Geochimica et Cosmochimica Acta 2016, 194, 279-290

Current Research (expanded description): To reconstruct the past mean water table depth, I will measure the stable isotopes of three noble gases: krypton, argon, and xenon. These gases become fractionated in soil air, where gravity causes the heavier isotopes to be enriched linearly with depth. The isotopic composition of these gases dissolved in the groundwater reflects the isotopic composition of the air just above the water table, and thus the depth of the water table, at the time of recharge. I aim to make past-water table measurements for water that was most recently equilibrated with the atmosphere shortly before lithium mining began in the 1980s, but a past-water table depth signal of any age will be of scientific interest to better understand the hydrology of the basin.

Benefits to Science and Society: Understanding the history of groundwater in this region will help assess the impacts of lithium mining on the groundwater and the ecosystem that depends on it -- the basis of life for indigenous communities living throughout the Andean Highlands. This is especially urgent now as electric vehicles, powered by lithium batteries, make gains as a proposed climate solution. Lithium mining impacts and minimal carbon emissions reductions put the benefit of electric vehicles into question and urge us to seek alternative solutions.

Personal Interests: I am involved in activism (in addition to research) around Indigenous resistance to mining exploitation. I also enjoy dancing, writing, and cooking.

ARCS Award: My research took an unexpected turn in the second year of my Ph.D., veering from Antarctic ice to lithium mining impacts on groundwater. Because I developed this new project independently of my advisor and his existing funding, I had very few resources to make it a reality. Receiving the ARCS Foundation award last year empowered me to get the project off the ground -- to build sampling equipment, travel to the field, and continue strengthening my working relationship with local desert communities. I conducted a pilot study in April, 2019, and have been able to successfully measure these samples. This year, the award would go toward a second, more thorough field campaign to collect higher quality samples from more strategic sites of interest, with the intent of providing relevant data for local communities and other interested parties. I am deeply grateful for this award for supporting my passion for community-informed socially-relevant research.

VICTOR WINGTAI OR

University of California San Diego

Division of Physical Sciences

Concentration: Analytical and Atmospheric Chemistry

Specialization: Environmental Surface Chemistry

Donor: Ellen Browning Scripps Foundation

Humans spend a large portion of their time in indoor spaces, but our understanding of these indoor environments is limited due to the overwhelming diversity of indoor spaces. Victor studies how common surfaces, such as windows and painted walls, influence indoor air quality. Substances emitted during indoor activities like cooking and cleaning stick and remain bound on these surfaces. These materials can partake in chemical reactions which alter the chemical makeup at the surface and can impact what compounds come off the surfaces back to room air.

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

Awards and Honors: San Diego Fellowship 2018 - 2019; ARCS Foundation, Inc. - San Diego Chapter Award 2018–2019, 2019-2020

Publications, Papers, and Posters:

Or, V.W.; Wade, M.; Patel, S.; Alves, M.R.; Kim, D.; Schwab, S.; Przelomski, H.; O'Brien, R.; Rim, D.; Corsi, R.L.; Vance, M.E.; Farmer, D.K.; Grassian, V.H. Glass surface evolution following gas adsorption and particle deposition from indoor cooking events as probed by microspectroscopic imaging and characterization. Environ. Sci. Process. Impacts 2020, 22, 1698-1709

Or, V.W.; Alves, M.R.; Wade, M.; Schwab, S.; Corsi, R.L.; Grassian, V.H. Crystal clear? Microspectroscopic imaging and physicochemical characterization of indoor depositions on window glass. Environ. Sci. Technol. Lett. 2018, 5 (8), 514–519

Or, V.W.; Estillore, A.D.; Tivanski, A.V.; Grassian, V.H. Lab on a tip: atomic force microscopy–photothermal infrared spectroscopy of atmospherically relevant organic/inorganic aerosol particles in the nanometer to micrometer size range. Analyst. 2018, 143, 2765-2774

Current Research (expanded description): Indoor chemistry is a rapidly growing field in environmental research. Indoor surfaces are known to readily interact with the constituents of air indoors, acting as reservoirs for material accumulation and subsequent re-emission over time. However, understanding how surfaces influence indoor air quality is largely confounded by the overwhelming diversity in the types of indoor surfaces and micro-environments these surfaces are subsequently exposed to. As surfaces age, gas-phase interactions and particle deposition modify the surface structure and composition. These surface-bound materials can persist for months or years – significantly longer than the air exchange rate, the typical limiting factor in most chemical reactions indoors. Victor's research targets these indoor surface processes by using high resolution spectroscopy and microscopy to directly probe the chemical and physical evolution of common indoor surfaces like window glass and painted walls. To develop a molecular-level understanding of indoor surface processes, Victor is focused on untangling the influence that different indoor environments and activities have on the evolution of indoor surfaces and the subsequent reactivity of these aged surfaces with oxidative gases commonly found indoors.

Benefits to Science and Society: Findings from the indoor chemistry community are being incorporated between aerosol, gas-phase, and surface chemists. These integrated measurements are used to develop and improve theoretical models for a more predictive understanding of how different activities and conditions influence air quality indoors. These findings can be used by numerous parties, ranging from policy-makers and material manufacturers to, most importantly, everyday consumers and occupants as the basis for data- and science-driven decision making to promote healthier indoor conditions.

Personal Interests: In his free time, Victor enjoys dancing, cooking, and has recently started learning to play the piano.

ARCS Award: The ARCS Foundation is a wonderful medium in which not only the public can directly support research in STEM, but also a reminder to students actively involved in research that there is broader interest and support of the work we do. No words can really capture how invaluable this support is, and it serves as one of the most important sources of motivation to continuously strive to become better and push my research forward.

JASON ALEXANDER PLATT

University of California San Diego

Division of Physical Sciences

Concentration: Biophysics

Specialization: Neuroscience/Artificial Intelligence

Donor: Legler Benbough Foundation

Jason is exploring the boundaries between physics, neuroscience and computer science in order to build more biologically-realistic neural networks. He is taking as his model system the insect—specifically the locust—olfactory pathway, a network which has evolved to identify chemical constituents in odors rapidly and accurately, and for which there is enough known biologically to use as a basis for machine learning. Biologically based artificial intelligence programs hold the promise of being able to learn much faster than current systems, while being robust to noise and adversarial attacks.

Degrees: M.S in Applied Physics and Engineering, Stanford University; B.S in Physics, Stanford University

Awards and Honors: UCSD Physics Excellence Award; Departmental Honors, Stanford University Department of Physics

Publications, Papers, and Posters:

Platt, J.; Miller, A.; Abarbanel, H. Machine learning classification informed by a functional biophysical system. Physical Review Letters (Submitted), 2019

Platt, J.; Moehle, N.; Fox, J.; Dally, W. Optimal operation of a plug-in hybrid vehicle. IEEE Transactions on Vehicular Technology, 2018

Miller, A.; Li, D.; **Platt, J.**; Margoliash, D.; Abarbanel, H. Statistical data assimilation: Formulation and examples from neurobiology. Frontiers in Applied Mathematics and Statistics–Dynamical Systems, 2018

Platt, J.; Hofle, W.; Pollok, K.; Fox, J. Equalizer design techniques for dispersive cables with application to the SPS Wideband Kicker. Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, vol. 868, 2017, pp. 93–97

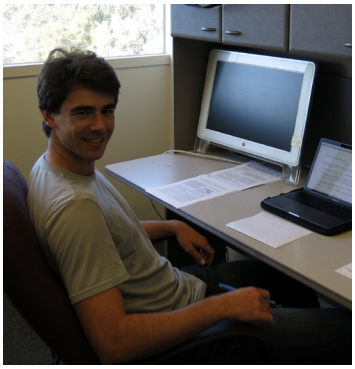
Current Research (expanded description): Computational neuroscience employs theoretical analysis to understand the principles that underlie the structure, function and abilities of the central nervous system. Fundamentally, we are exploring nature's own solutions to interesting functional questions— e.g. how to classify the information content of images, how olfactory systems learn to classify odors, how songbirds learn to sing. Inspired by these biological solutions we seek to construct silicon-based networks to solve equivalent problems that are key to machine intelligence. We are taking as our model system the insect—specifically the locust—olfactory pathway, a network which has evolved to identify chemical constituents in odors rapidly and accurately, and for which there is enough known biologically to use as a basis for machine learning.

The insect olfactory system consists of a feedforward network, with mutual inhibition within each layer. Much of the processing takes place in a layer called the antennal lobe which can be described by a network architecture called winnerless competition (WLC). WLC separates out the input into spatio-temporal signals, giving us a clear way to discriminate between different kinds of input. We are proposing to use this WLC paradigm as the basis for a neural network composed of biophysically realistic neurons.

Benefits to Science and Society: Artificial intelligence is revolutionizing almost every aspect of our society. Current artificial networks, built around oversimplified neurons and synapses, are brittle and susceptible to sophisticated attacks. By basing themselves on nature's own solutions to functional problems, biological-based neural networks hold the promise of solving these issues and allowing us to have more confidence in the networks we build. Bringing together neuroscience, computer science and physics, my work will help bring AI research back to its roots in biophysics in order to build the next generation of neural networks.

Personal Interests: I am an avid backpacker and just finished 200 miles of the John Muir Trail. Musically I play trumpet. Also play sports such as soccer/tennis. Surf when the weather is good.

ARCS Award: The ARCS Foundation award lets me concentrate on research and allows me to travel to conferences and collaborators in the summer instead of having to teach. This is a significant boost to my ability to further my career as well as scientific progress and collaboration across institutions.



CHANNING JOSEPH PREND

University of California San Diego

Scripps Institution of Oceanography

Concentration: Physical Oceanography

Specialization: Air-sea Interaction

Donor: ARCS Foundation – San Diego / Toby Eisenberg

Channing studies the exchange of heat and carbon dioxide between the ocean and atmosphere, which regulates the global climate system. He uses measurements from autonomous robotic floats, as well as satellite data and numerical models, to research how ocean circulation contributes to patterns of biological productivity and carbon uptake in the Southern Ocean, which surrounds Antarctica. This region plays an outsized role in the global ocean circulation and carbon cycle, and thus, studying these processes is crucial to improving climate models and future climate projections.

Degree: B.A. in Earth Science and Mathematics, Columbia University

Awards and Honors: Chateaubriand Fellowship, French Embassy to the USA 2020-21; Geophysical Fluid Dynamics Fellowship, Woods Hole Oceanographic Institution 2019; National Science Foundation Graduate Research Fellowship 2017-2020; Walter C. Pitman III Award, Columbia University 2017

Publications, Papers, and Posters:

Prend, C.J.; Flierl, G.R.; Smith, K.M.; Kaminski, A.K. Parameterizing eddy transport of biogeochemical tracers. Geophysical Research Letters (submitted)

von Berg, L.; **Prend, C.J.**; Campbell, E.C.; Mazloff, M.R.; Talley, L.D.; Gille, S.T. Weddell Sea phytoplankton blooms modulated by sea ice variability and polynya formation. Geophysical Research Letters 2020, 47, e2020GL087954

Prend, C.J.; Gille, S.T.; Talley, L.D.; Mitchell, B.G.; Rosso, I.; Mazloff, M.R. Physical drivers of phytoplankton bloom initiation in the Southern Ocean's Scotia Sea. Journal of Geophysical Research: Oceans 2019, 124, 5811-5826

Prend, C.J.; Seo, H.; Weller, R.A.; Farrar, J.T. Impact of freshwater plumes on intraseasonal upper ocean variability in the Bay of Bengal. Deep-Sea Research II 2018, 161, 63-71

Current Research (expanded description): Physical and biogeochemical processes in the ocean occur over a

wide range of spatial and temporal scales. This poses an observational challenge since the ocean is immense, and thus it is impossible to collect measurements at every place and time. The Southern Ocean, which surrounds Antarctica, has particularly few historical measurements since it is such a remote and harsh environment. This region is known to play a disproportionately large role in the oceanic uptake of heat and carbon dioxide; however, the spatial and temporal variability is not well constrained due to lack of data. Recent advances in autonomous float technology allow us to observe the Southern Ocean from the comfort of San Diego. This array of more than 170 floats has provided unprecedented spatial and temporal coverage of subsurface biogeochemical measurements in the Antarctic. Using this unique dataset, we are investigating the physical controls on Southern Ocean biological productivity and air-sea carbon fluxes. Characterizing this variability, and the mechanisms that drive it, is necessary to better understand the role of the ocean in the climate system.

Benefits to Science and Society: Autonomous observing systems are changing the way that we see the ocean by providing data in hard-to-reach places like the Antarctic. My research combines this cutting-edge technology with satellite data and numerical model output to help discern the physical mechanisms that control ocean ecosystems and the global carbon cycle. Understanding these drivers is key to improving climate models and predicting the response of the ocean to climate change.

Personal Interests: Science communication and outreach, history and philosophy of science, violin, rowing, swimming, and hiking.

ARCS Award: Receiving an ARCS Foundation Award is a great honor and will alleviate financial stress. My motivation in coming to graduate school was to conduct societally-relevant research and communicate that science to the broader public, so it feels great to be recognized by an organization that has helped advance STEM in the US for decades.

DIMITRIOUS ADRIAN SCHREIBER

University of California San Diego

Jacobs School of Engineering

Concentration: Electrical Engineering

Specialization: Medical Robotics

Donor: Beyster Family Foundation

Dimitri's research focuses on the development and clinical translation of general-purpose Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) guided needle-placement robots. These environments are challenging to work within due to their combination of a confined working area while simultaneously requiring high manipulation dexterity. Dimitri is beginning clinically relevant tests of his highly dexterous CT compatible needle driving robot and developing an MRI compatible version of this system. This project's goal is to increase patients' standard of care, allowing earlier treatment with less pain while increasing consistency for procedures that require intraoperative imagery.

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

Awards and Honors: Shah Family Fellowship 2020; NSF Graduate Research Fellowship 2019; ARCS Award 2018, 2019, 2020; Chancellor's Research Excellence Scholarship 2017

Publications, Papers, and Posters:

Schreiber, D.A.*; Richter, F.*; Bilan, A.**; Gavrilov, P.**; Man, H.L.**; Price, C.H.**; Carpenter, K.C.; Yip, M.C. ARCSnake: An Archimedes' screw-propelled, reconfigurable robot snake for complex environments. IEEE/RSJ International Conference on Robotics and Automation (ICRA). 2020. *co-authors,**co-second authors

Schreiber, D. A.; Jiang, H.; Li, G.; Yu, J.; Yu, Z.; Zhu, R.; Norbash , A.; Yip, M. CRANE: A highly dexterous needle placement robot for evaluation of interventional radiology procedures. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). Workshop on Intelligent Robot Interactions with the Anatomy. 2019

Schreiber, D.; Shak, D.; Norbash, A.; Yip, M. An open-source 7-axis, robotic platform to enable dexterous procedures within CT scanners. Proceedings of IEEE/RSJ Intl. Conference on Intelligent Robots and Systems (IROS). 2019

Schreiber, D.; Norbash, A.; Yip, M. MRI guided hyper-redundant biopsy robot. Proceedings of IEEE/RSJ Intl. Conference on Intelligent Robots and Systems (IROS), Workshop on Continuum Robots in Medicine: Design, Integration. 2017

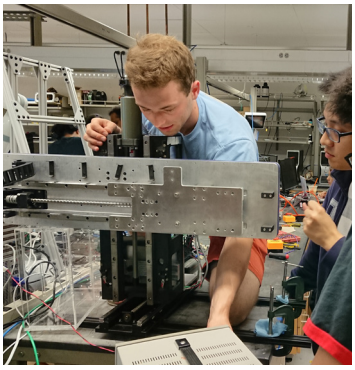
Current Research (expanded description): My research is focused on the development and clinical translation of a general purpose highly dexterous needle-placement robot for use within medical imaging scanners. I am initially focusing on percutaneous lung biopsy. The requirements for lung biopsy differ significantly from other image guided procedures as they require a large working area with a moving target, and use a substantially longer needle. My robotic system achieves this through the use of a low-profile cable-driven in-scanner robotic arm mounted to a large travel base positioning stage. Via path planning and a clinically representative virtual environment, the system was shown to be able to reach across the body at a multitude of insertion angles. The needle is grasped using a clutch-brake assembly composed of two helically wrapped Nitinol Shape Memory Alloy Actuator (SMA) powered clutches connected to the robot's final prismatic joint. This grasping mechanism is both low cost and sterilizable. This previous summer, I additionally co-lead the system development of a snake-like mobile robot which was the first proof-of-concept demonstration for the NASA EELS project. Our novel system uses a combination of powered Archimedes' screws and universal joints to create a dexterous snake which can locomote through tortuous terrain and chasms.

Benefits to Science and Society: Interventional Radiologists perform a wide variety of procedures under Computed Tomography (CT) image guidance, including percutaneous needle lung biopsy. Lung cancer accounts for over one-quarter of all cancer deaths worldwide. Early detection using image-guided needle biopsy is highly correlated with survival. However, the current CT-guided method provides limited resolution and poor precision. My research will allow for the early diagnosis of lung cancer and improved patient care in other diseases while expanding the procedures possible within MRI and CT scanners.

Personal Interests: I enjoy surfing, hiking, and climbing - anything that gets me outside in the sun!

ARCS Award: The ARCS Foundation award has introduced me to a wonderful group of people while increasing my financial security, allowing me to more efficiently and freely pursue my research. Additionally, the networking and non-academic opportunities have proven to be both incredibly motivating and valuable.

dimitrischreiber.weebly.com



SAMANTHA LYLAH SISON

University of California San Diego

School of Medicine

Concentration: Cell and Molecular Biology

Specialization: Neurobiology and Stem Cell Biology

Donor: Dottie Georgens

Sammi's research project aims to understand the molecular mechanisms underlying Huntington's disease, a progressive neurodegenerative disorder that leads to motor and cognitive problems and eventually death. With a background in stem cell biology and neuroscience, Sammi uses induced pluripotent stem cells from people with Huntington's disease to study the genetic pathways that may be contributing to neurodegeneration in the brain. By using this system, she hopes to identify therapeutic targets for the potential treatment of people with Huntington's disease.

Degrees: B.S. in Neurobiology, University of Wisconsin Madison

Awards and Honors: NSF-GRFP 2020; Honorable Mention - Ford Foundation Pre-doctoral Fellowship 2020; Hilldale Undergraduate Research Fellowship 2015

Publications, Papers, and Posters:

Sison, S.L.; O'Brien, B.S.; Johnson, A.J.; Seminary, E.R.; Terhune, S.S.; Ebert, A.D. Human cytomegalovirus disruption of calcium signaling in neural progenitor cells and organoids. J. Virol. 2019, 93 (17). https://doi.org/10.1128/JVI.00954-19

Sison, S.L.; Vermilyea, S.C.; Emborg, M.E.; Ebert, A.D. Using patient-derived induced pluripotent stem cells to identify Parkinson's disease-relevant phenotypes. Curr. Neurol. Neurosci. Rep. 2018, 18 (12), 84. https://doi.org/10.1007/s11910-018-0893-8

Sison, S.L.; Ebert, A.D. Decreased NAD+ in dopaminergic neurons. Aging (Albany NY). 2018, 10 (4), 526–527. https://doi.org/10.18632/aging.101433

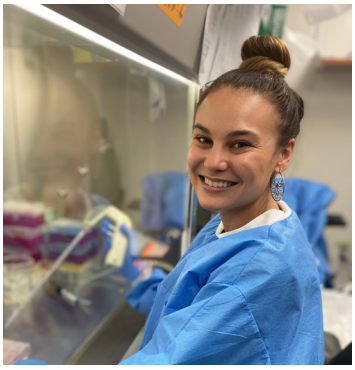
Sison, S.L.; Patitucci, T.N.; Seminary, E.R.; Villalon, E.; Lorson, C.L.; Ebert, A.D. Astrocyte-produced MiR-146a as a mediator of motor neuron loss in spinal muscular atrophy. Hum. Mol. Genet. 2017, 26 (17), 3409–3420. https://doi.org/10.1093/hmg/ddx230

Current Research (expanded description): As a graduate student, my primary focus is to study the RNA metabolism defects that underly Huntington's disease (HD), while also understanding the basic neurobiology of RNA transport and local translation in human neurons. Recent studies indicate widespread RNA metabolism defects in HD, such as mislocalization and mistranslation of mRNAs, which are suggested to be a main cause of pathology in the disease. One way these defects may be arising is through the binding and sequestration of important RNA binding proteins (RBPs) to mutant HTT CAG repeat RNA. Therefore, my dissertation is aimed at testing and evaluating this hypothesis in human striatal neurons, the cells most affected by the disease, derived from people with HD. I will be utilizing novel proximity labeling techniques and cutting-edge INSTA-seq spatial transcriptomics in combination with high-throughput microfluidics to study the binding partners of CAG repeat RNA that may be leading to mRNA transport and local translation problems in human neurons from patients with HD.

Benefits to Science and Society: My project aims to elucidate two different aspects of RNA metabolism that are disrupted in Huntington's disease and repeat expansion diseases. Specifically, this work may identify hundreds of candidate cell-type-relevant proteins and transcripts that could be targeted for the treatment of these diseases. Additionally, this research will aid in our understanding of how RNA metabolism is regulated in neurons, fundamental knowledge that is broadly applicable to many diseases that affect the nervous system.

Personal Interests: In my personal time, I enjoy hiking with my dogs, practicing yoga, cooking, and gardening.

ARCS Award: I feel very honored to be a recipient of the ARCS Foundation award this year and feel supported in my scientific career goals. Coming from a low-income background, I deeply value the generous financial support from the ARCS Foundation, as this allows me to focus more of my attention on my research and academics rather than worrying about financial burdens that come along with being a graduate student. Additionally, the ARCS Foundation award is an amazing reminder that our community values scientific research and the advancement of students in STEM.



MATTHEW DAVID STONE

University of California San Diego / San Diego State University

School of Medicine

Concentration: Public Health - Health Behavior

Specialization: Tobacco Regulatory Science

Donor: Kenneth and Marjorie Blanchard

Matthew's research uses choice-based preference tasks, sensor technology and ecologically driven data to investigate the impact that graphic warning labels affixed to cigarette packaging have on consumer health perceptions, thoughts of quitting, and behavioral outcomes among daily smokers. His research also focuses on identifying product characteristics of e-cigarettes that can be altered in order to protect youth and mitigate the harms of vaping. Combined, this high-impact research aids in reducing the global health burden of tobacco-related morbidity and mortality.

Degree: B.S. in Sociology, California State University Long Beach

Awards and Honors: Tobacco-Related Disease Research Program (TRDRP) - Predoctoral Fellowship Award 2018-2021; Travel Award, Society for Research on Nicotine and Tobacco (SRNT) annual meeting

Publications, Papers, and Posters:

Pierce, J.P.; Strong, D.R.; **Stone M.D.**; Villaseñor, A.; Dimofte, C.V.; Leas E.C.; Oratowski, J.; Brighton, E.; Hurst, S.; Pulvers. K.; Kealey. S.; Chen, R.; Messer, K. Real-world exposure to graphic warning labels on cigarette packages in US smokers: The CASA randomized trial protocol. 2020, Contemporary Clinical Trials 2020, 98, 106152

Stone, M.D.; Dimofte, C.V.; Strong, D.R.; Villaseñor, A.; Pulvers, K.; Messer, K.; Pierce, J.P. Tool to assess appeal-aversion response to graphic warning labels on cigarette packs among United States smokers. Tobacco Control. 2020 (advance online publication)

Stone, M.D.; Matheson, B.E.; Leventhal, A.M.; Boutelle, K.N. Development and validation of a short form Children's Power of Food Scale. Appetite 2020, 147, 104549

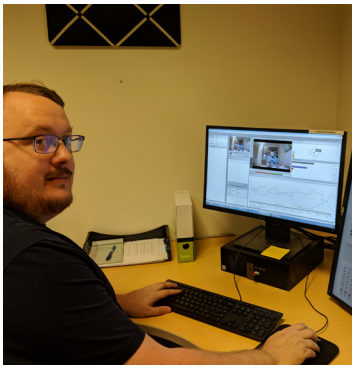
Pierce, J.P.; Ruifeng C.; Leas, E.C.; White, M.M.; Kealey, S.; **Stone M.D.**; Benmarhniaa, T.; Trinidad, D.R.; Strong D.R.; Messer, K. Tobacco products used and progression to daily cigarette smoking in US youth and young adults. Pediatrics. (in press)

Current Research (expanded description): Matthew aims to determine how the initial response to graphic warning labels on cigarette packs impacts health perceptions, sensory appeal, quit intentions, and day-to-day smoking consumption over a three-month intervention where participants purchase and smoke their cigarettes from study packs: a) industry packs with marketing intact, b) blank packs with marketing removed, and c) three graphic warning packs. Using facial affective machine learning algorithms, text analytics of verbalized reactions to packs, and marketing techniques in choice-based conjoint, he is seeking to clarify that initial responses to the graphic warnings do not simply reflect provocation but mark impactful processing of health risks of smoking, a precursor to smoking reduction. He is examining whether acute reactions are temporary or diminish after prolonged exposure to graphic packaging. Further, Matthew is investigating what e-cigarette product attributes are most important to users, and which populations (e.g., youth vs. adults) value different attributes. Using an orthogonal discrete choice trade-off task, he is examining the importance of product attributes and corresponding price worth estimates. This research will provide evidence of which FDA regulations may be most effective at reducing youth initiation of e-cigarettes without discouraging adult cigarette smokers from transitioning to e-cigarettes.

Benefits to Science and Society: Matthew's research may provide evidence that mandating graphic warnings on US cigarette packs would induce smoker aversion to these packs and potentially deter cigarette purchasing. Further, his research into youth vaping will provide FDA regulatory authorities with information regarding which e-cigarette attributes (e.g. flavor, nicotine concentrations, etc.) are prime targets for regulation to curb the youth vaping epidemic.

Personal Interests: Aside from research, Matthew enjoys mountain biking, playing board games, solving complex puzzles, and spending time with friends and family.

ARCS Award: The ARCS Foundation award is a distinguished honor that I am grateful to have again received. To me this award is more than just recognition of merits, it is an opportunity to be part of a welcoming and like-minded community that shares the goal of bettering society. The Foundation's generosity is more than an award and recognition. The financial advice, etiquette training, and networking prospects have all meaningfully contributed to both my personal and professional endeavors. I cannot speak to what my Ph.D. studies would be like without the generous support from the foundation, for I have been a fortunate recipient for several years. Yet, I do know that this award is directly associated with my scientific productivity by allowing me to focus my time and energy on research and helping to improve the lives of others. Thank you



ANTHONY QUOC VU

University of California San Diego

School of Medicine

Concentration: Biomedical Sciences

Specialization: Genetics and Genomics

Donor: Hervey Family Non-Endowment Fund

Anthony's research focuses on understanding how stress granules may contribute to neurodegenerative diseases. Stress granules are transient clumps of protein and RNA that form inside the cell when exposed to environmental stresses. These assemblies protect their molecules from damage and help the cell survive. Importantly, abnormal formation and clearance of stress granules may impact cell survival and are implicated in the pathogenesis of neurodegeneration. Through experimental methods, his goals are to identify components that contribute to stress granule biology and to determine how misregulation of key genes may contribute to disease progression.

Degrees: M.S. in Biology, University of California San Diego; B.S. in Biochemistry and Cell Biology, University of California San Diego

Awards and Honors: Outstanding Research Poster, CNG Brainstorm Symposium 2018; National Science Foundation (NSF) Graduate Research Fellowship 2016

Publications, Papers, and Posters:

Begovich, K.; **Vu, A.Q**.; Yeo, G.; Wilhelm, J.E., Conserved metabolite regulation of stress granule assembly via AdoMet. J Cell Biol 2020, 219 (8)

Wheeler, E.C.*; **Vu, A.Q.***; Einstein, J.M.; DiSalvo, M.; Ahmed, N.; Van Nostrand, E.L.; Shishkin, A.A.; Jin, W.; Allbritton, N.L.; Yeo, G.W., Pooled CRISPR screens with imaging on microraft arrays reveals stress granule-regulatory factors. Nat Methods 2020, 17 (6), 636-642. *co-first authors

Fang, M.Y.; Markmiller, S.; **Vu, A.Q.**; Javaherian, A.; Dowdle, W.E.; Jolivet, P.; Bushway, P. J.; Castello, N. A.; Baral, A.; Chan, M.Y.; Linsley, J.W.; Linsley, D.; Mercola, M.; Finkbeiner, S.; Lecuyer, E.; Lewcock, J.W.; Yeo, G. W. Small-molecule modulation of TDP-43 recruitment to stress granules prevents persistent TDP-43 accumulation in ALS/FTD. Neuron 2019, 103 (5), 802-819 e11

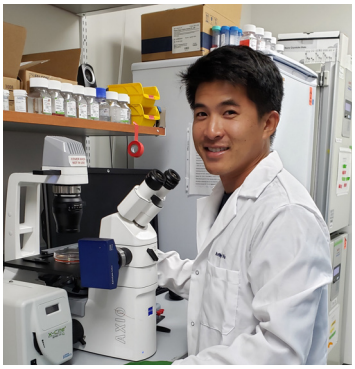
Krach, F.; Batra, R.; Wheeler, E.C.; **Vu, A.Q.**; Wang, R.; Hutt, K.; Rabin, S.J.; Baughn, M.W.; Libby, R.T.; Diaz-Garcia, S.; Stauffer, J.; Pirie, E.; Saberi, S.; Rodriguez, M.; Madrigal, A.A.; Kohl, Z.; Winner, B.; Yeo, G.W.; Ravits, J. Transcriptome-pathology correlation identifies interplay between TDP-43 and the expression of its kinase CK1E in sporadic ALS. Acta Neuropathol 2018, 136 (3), 405-423

Current Research (expanded description): Stress granules (SGs) are dynamic cytoplasmic assemblies of ribonucleoprotein complexes. By stalling mRNA translation and sequestering aggregation-prone proteins, these transient membraneless structures are thought to be a cytoprotective response during cellular stress. Defects in SG assembly and clearance are firmly linked to neurodegenerative disease: stable SG-like inclusions in brain are hallmarks of amyotrophic lateral sclerosis (ALS) and related disorders, and genetic mutations in SG proteins cause familial forms of these diseases. While recent in vitro proteomic studies using biochemical fractionation and protein proximity-labeling techniques have identified over 400 SG components, little remains known about which proteins regulate SGs. It is of great importance to identify components critical to SG formation and disassembly to further our understanding of the basic biology of SGs. Excitingly, recent studies have demonstrated that therapeutic reduction of select, known SG components may provide neuroprotective effects in animal models of ALS. My objective is to take a multidisciplinary approach to evaluate the cellular stress response after protein depletion. My collaborators and I are developing a cross-paradigm discovery and validation strategy to systematically prioritize these SG components to understand their roles in neuronal function, and if their reduction provides durable, curative effects in ALS models.

Benefits to Science and Society: Amyotrophic lateral sclerosis (ALS) is a fatal, incurable disease characterized by degeneration of motor neurons. Abnormal protein aggregates are a central pathological hallmark of ALS; however, the molecular mechanisms that contribute to the disease remain largely unknown. Because tight regulation of stress granule assembly-disassembly is critical for cell viability and dysregulation is linked to neurodegenerative diseases, characterizing key components that regulate stress granules is both necessary to our understanding of protein aggregation and harnesses potential implications for personalized therapeutic intervention.

Personal Interests: I enjoy playing tennis, drawing and painting, cycling, rock climbing, working on cars, competing in automotive racing events, and snowboarding.

ARCS Award: Funding from the ARCS Foundation affords me the flexibility to focus on my research training and pursue cross-disciplinary research problems in assay development, disease biology, and therapeutics.



ALEXANDER JEFFREY WHITEHEAD

University of California San Diego

Jacobs School of Engineering

Concentration: Bioengineering

Specialization: Regenerative Medicine and Tissue Engineering

Donor: Reuben H. Fleet Foundation

Alex studies how the immune system regulates how the heart heals after a heart attack. He also studies how certain animals can regenerate their hearts, and if we can use similar processes to heal human hearts. He uses large datasets to decipher how protein composition of the heart changes with age and in instances of disease. By combing data-driven approaches and molecular biology techniques, he hopes to identify drug targets to improve outcomes of heart attack patients.

Degree: B.S. in Biomedical Engineering, Virginia Commonwealth University

Awards and Honors: National Science Foundation Graduate Research Fellowship 2018; 2nd Place Young Investigator Award at IADR/AADR 2017; VCU Undergraduate Research Poster Award 2014; Provost Scholarship – Virginia Commonwealth University 2013

Publications, Papers, and Posters:

Cohen, D.J.; Cheng, A.; Kahn, A.; Aviram, M.; **Whitehead, A.J.**; Hyzy, S.L.; Clohessy, R.M.; Boyan, B.D.; Schwartz, Z. Novel osteogenic Ti-6Al-4V device for restoration of dental function in patients with large bone deficiencies: Design, development and implementation. Sci. Rep. 2016, 6

Hyzy, S.L.; Cheng, A.; Cohen, D.J.; Yatzkaier, G.; **Whitehead, A.J.**; Clohessy, R.M.; Gittens, R.A.; Boyan, B.D.; Schwartz, Z. Novel hydrophilic nanostructured microtexture on direct metal laser sintered Ti-6Al-4V surfaces enhances osteoblast response in vitro and osseointegration in a rabbit model. J. Biomed. Mater. Res. Part A 2016, 104 (8), 2086–2098

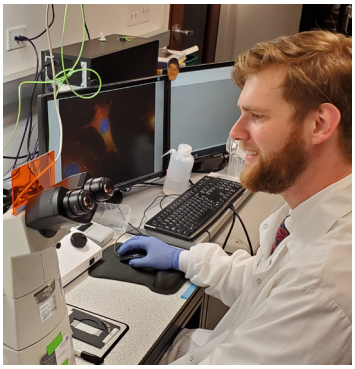
Current Research (expanded description): Alex is developing an in-vitro co-culture model for cardiac fibroblasts and macrophages that allows for extracellular matrix assays. While he is currently using U937 monocytes and converting them into macrophages using PMA, he hopes to move to human primary monocytes and convert them using M-CSF and GM-CSF to provide more accurate results. He would also like to investigate how tissue-resident macrophages differ from monocyte-derived cells and how the early healing cascade impacts late-stage fibrosis after myocardial infarction.

The second half of his project involves investigating how single-nucleotide polymorphisms at the 9p21 locus influence healing outcomes using this in-vitro model. He recently finished generating iPSC-derived cardiac fibroblasts from risk haplotypes and TALEN risk-knockout iPSCs. While the Engler lab has previously shown that p14-16 modulate stress-response for risk haplotype cardiomyocytes, Alex hopes to identify a genetic master regulator for fibrosis that links observed clinical outcomes to risk status.

Benefits to Science and Society: Ischemic heart disease is the leading cause of mortality world-wide, according to the World Health Organization in 2016. Alex has identified a combination of drug targets for post-myocardial infarction treatment that he hopes will lead to improved mortality and cardiac function outcomes. By using regenerative organisms as models for cardiac regeneration, he hopes to coax the adult human heart into a better state of repair.

Personal Interests: In his free time, Alex likes to create music, cook, and snowboard in the winter.

ARCS Award: I am very grateful to receive the ARCS award for my research. It is encouraging to be supported by such a progressive community-focused organization that builds bridges between scientists and the local professionals. This support will help fund my heart regeneration research and demonstrates a commitment to public health and community engagement.



JIARONG ZHOU

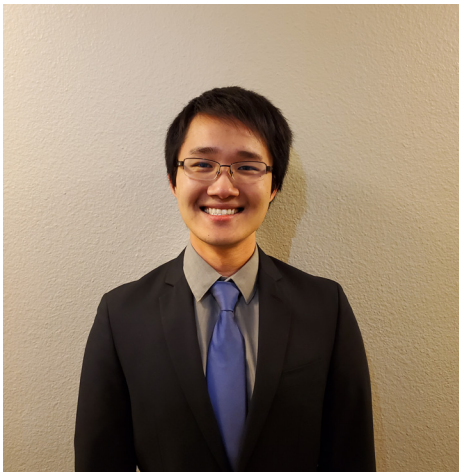
University of California San Diego

Jacobs School of Engineering

Concentration: NanoEngineering

Specialization: Vaccine Development

Donor: Donald C. and Elizabeth M. Dickinson Foundation



Jiarong's research focuses on leveraging tiny particles for the development of vaccines against both infectious diseases and cancer. Vaccines are the safest and most effective means of fighting against infections. By introducing the foreign substances into the immune system in a safe manner, our immune cells can be taught to fight against the pathogens and cancerous cells. Jiarong is currently utilizing cell membrane-coated nanoparticles to create personalized vaccine formulations for individual patients.

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

Awards and Honors: Ford Foundation Predoctoral Fellowship 2019-2022; Institute for Global Entrepreneurs, Technology Management & Entrepreneurism Fellow 2019-2020; National Institute of Health T32 Training Grant 2017-2019; Carbon Neutrality Initiative Student Fellowship 2015-2016

Publications, Papers, and Posters:

Zhou, J.; Krishnan, N.; Jiang, Y.; Fang, R.; Zhang, L. Nanotechnology for virus treatment. Nano Today 2020, 32(13), 1901255

Zhang, Q.*; Honko, A.N.*; **Zhou, J.***; Gong, H.; Downs, S.N.; Henao Vasquez, J.; Fang, R.; Gao, W.; Griffiths, A.; Zhang, L. Cellular nanosponges inhibit SARS-CoV-2 infectivity. Nano Letters 2020, 20(7), 5570-5574. *co-first-authors

Zhou, J.; Kroll, A.; Holay, M.; Fang, R.; Zhang, L. Biomimetic nanotechnology towards personalized vaccines. Advanced Materials 2019, in press

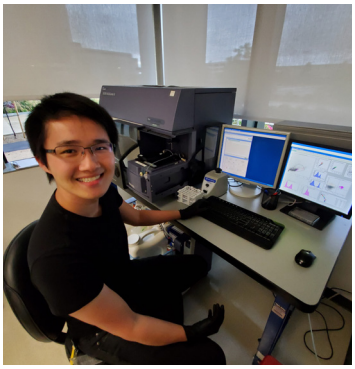
Kroll, A.; Fang, R.; Jiang, Y.; **Zhou, J.**; Wei, X.; Yu, C.L.; Gao, J.; Luk, B.; Dehaini, D.; Gao, W.; Zhang, L. Nanoparticulate delivery of cancer cell membrane elicits multi-antigenic antitumor immunity. Advanced Materials 2017, 29(47), 1703969.

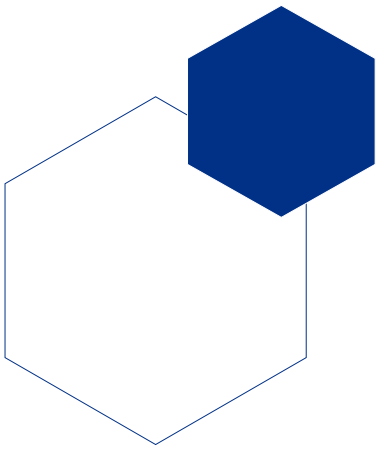
Current Research (expanded description): My research focuses on cell membrane-coating nanotechnology, in which we strip plasma membrane from natural cells and coat them onto the surface of nanoparticles to preserve the surface functionalities. More specifically, I am leveraging the technology to generate new vaccines without the need for in-depth studies of each pathogen. Since our immune systems recognize foreign entities by probing their surface, most of the antigenic markers can be found on the surface. By utilizing cell membrane-coated nanoparticles, we can directly train our immune systems against those surface markers without the need to understand them. Through varying the source cells, such as cancer cells, parasites, and bacteria, different types of vaccines can be generated against specific pathogens. In addition, cell membrane-coated nanoparticles can be used to capture bacterial toxins. A wide variety of toxins secreted by pathogens can disrupt host cells. However, many of these toxins act on the membrane surface. By using the same source cells, the inanimate nanoparticles can capture the toxins in their native form. Vaccination with the toxin-bound nanoparticles can elicit immunity against the toxins and protect patients from the toxicity. In this manner, comprehending the exact mechanism of the toxins is unnecessary.

Benefits to Science and Society: Although vaccines have successfully helped prevent several dangerous diseases such as polio and tuberculosis, many bacterial infections rely on antibiotics as treatments. However, the spread of antibiotic resistance has far outpaced their discovery. Thus, by developing vaccines against the pathogens, we can slowly move away from using drugs as a cure-all and ultimately overcome the antibiotics resistance challenge. Furthermore, by advancing personalized formulations, medical decisions can be tailored to individual patients in order to maximize the efficacy of each treatment.

Personal Interests: I enjoy mentoring and teaching other people, programming, immersing in Japanese culture, cooking delicious food, and learning about innovative technologies.

ARCS Award: To me, receiving the ARCS Foundation award is a form of recognition. The award helps reinforce the idea that there are people who recognize that the work and research I am doing have major societal impacts. Furthermore, the funding from the award will allow me to dedicate more of my time towards research rather than stressing about any financial burdens.





University of San Diego

BYRON BATZ

University of San Diego

Hahn School of Nursing and Health Science

Concentration: Nursing

Specialization: Home Based Palliative Care

Donor: Beyster Family Foundation

Byron is studying how caregiving affects the health of those in the role of caregivers. This is important as not many programs currently exist that provide caregiving support, especially in the home environment.

Degrees: M.S. in Nurse Executive Leadership, University of San Diego; B.S. in Nursing, California State University Long Beach

Awards and Honors: Dean's Award 2019; ARCS Award presented by Beyster Family Foundation Fund IV 2018, 2019,2020; 2013 Daisy Award presented by Riverside Kaiser Permanente; 2012 Notable Nurse Award presented by Kaiser Permanente and the State of California

Current Research (expanded description): Patients in home-based palliative care receive nursing care when death is expected in less than one year and a skilled need exists. They also receive social services for community or financial resources. Lastly, they receive home-health-aide services if there is need for assistance with personal care. Most of the support system of home-based palliative care is focused on the patient. However, caregivers are often left without any support. Because the majority of caregivers are over 40 years of age, many of them have health conditions or are at risk of developing chronic illnesses. It would be beneficial to determine how the health of those providing care at home is affected. This could help develop a program or improve home-based palliative care to assist caregivers and prevent or minimize the negative effects caregiving has on their health.

Benefits to Science and Society: Quantifying the health decline of caregivers will provide data for use by health care organizations to develop or improve programs that can assist those providing caregiving in the home.

Personal Interests: Byron states that the best way of spending his time is with his wife and two daughters. He also loves taking his Jeep off road, riding his road bike in the mornings, fishing, and nature.

ARCS Award: It means immense support. It means a great foundation that makes earning a science degree much more enjoyable.

PEDRO ALONSO COLIO

University of San Diego

Hahn School of Nursing and Health Science

Concentration: Nursing

Specialization: Cardiology & Emergency Medicine

Donor: Beyster Family Foundation

Pedro Colio's research project is geared towards identifying the incidence and prevalence of hypertrophic cardiomyopathy in one of the most underserved counties in Southern California. A research project like this will be highly beneficial for science and members of this community. Pedro hopes to identify any particular trends or determinants of health associated with this condition. If any trends are found, they could potentially be used for early screening and management among certain individuals.

Degrees: M.S.N. in Primary Care Family Nurse Practitioner; B.S.N in Nursing Science, San Diego State University; A.S. in Nursing Science, Imperial Valley College

Awards and Honors: CVS Health Foundation Scholarship, August 2017 & 2018; Spence Foundation Scholarship, January 2016; HRSA Nurse Corps Scholarship, May 2013; Pioneer's Memorial Hospital Scholarship, August 2010

Publications, Papers, and Posters:

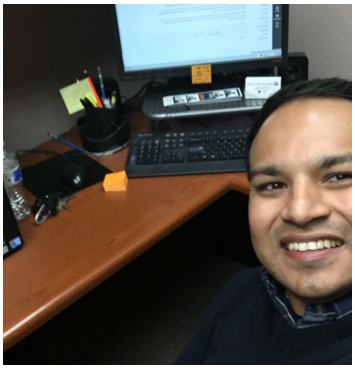
Colio, P.A. Rapid assessment of adults with traumatic brain injuries. California Association of Nurse Practitioners 41st Annual Educational Conference, San Diego, California, 2018. Poster Presentation (1st place award). Manuscript accepted for publication in the Advanced Emergency Nursing Journal

Current Research (expanded description): The aim of my research project is to identify the incidence and prevalence of hypertrophic cardiomyopathy (HCM) in an underserved community in California. My secondary aim is to identify any potential trends, comorbidities, or social determinants of health associated with HCM within the community. A large portion of individuals affected by HCM typically present at cardiology clinics in the later stages of the disease. Patients with HCM typically present with dyspnea on exertion, fatigue, syncope, or chest pain. There is a vast differential diagnosis for these types of complaints. This can lead primary-care providers to a delayed cardiology referral, eventually resulting in a missed or delayed diagnosis of HCM. Patients with HCM typically require lifelong treatment, surgical intervention, or in some cases a heart transplant. Identification

of any particular trends can help identify patients requiring early screening and referral to cardiology. Early diagnosis can lead to decreased morbidity, mortality, and earlier treatment. It could also prevent or delay the need for surgical management in some patients. My study design will be a retrospective medical-record review at the largest cardiovascular center in this community. I plan to review the charts of patients with HCM as far back as the electronic record allows.

Benefits to Science and Society: The benefits of my research will include identification of the incidence and prevalence of hypertrophic cardiomyopathy (HCM) in a very underserved community with no previous data. It will also help identify any potential trends associated with HCM. Any identified trends could lead to early screening and possible decrease in morbidity and mortality. Identification of any trends can also prevent cardiologists from overlooking or missing HCM while reviewing the echocardiogram, which is the gold standard diagnostic tool for HCM.

ARCS Award: The ARCS Foundation award means an opportunity for me to excel as a Ph.D. nursing student. It is an unexpected blessing for me to aim higher than I had originally planned. It is an opportunity for me to give back to my community and improve the quality of care with the use of research and science. Receiving the ARCS Foundation award is a true blessing to my family and me to achieve my longheld dream goal of becoming a nurse scientist. This award will be very helpful to my education and research. I am forever thankful to be part of the ARCS Scholars. I will work very hard to contribute recognizable research and meet your highest expectations. My ultimate goal is to make a difference and have a positive influence in the world. Your contribution will have made a huge difference in my life and educational journey. Thank you!



ANN OZAZE LAWANI

University of San Diego

Hahn School of Nursing and Health Science

Concentration: Nursing

Specialization: Cardiopulmonary Nursing and Palliative Care

Donor: Beyster Family Foundation

My research seeks to understand patients' lived experience, perceptions and misconceptions about transitioning to Palliative Care. Results from this research will help nurses become better educators for patients with chronic illnesses and enlighten nurses about ways to reduce the barriers that hinder successful transition. I am hopeful that in the future, this will encourage the inclusion of Palliative Care in the nursing curriculum and ensure a solid foundation for nurses from every background to meet the needs of patients, relating to appropriate communication about quality of life issues, not if, but when the need arises.

Degrees: M.S. in Nursing, University of San Diego; B.S. in Healthcare Administration, California State University Sacramento

Awards and Honors: ARCS Scholar 2020; Sharp Healthcare Caster Institute Education Scholarship 2020; Sharp Healthcare Guardian Angel Award 2020; Dean Graduate Merit Scholar, University of San Diego 2019-Present

Current Research (expanded description): My research seeks to merge the borders between curative and Palliative Care to help patients, nurses and healthcare providers become more aware of the need for early and continuous discussions about Palliative Care at the time of diagnosis and beyond. The purpose of this research is to contribute to the improvement of nursing practice, ensure improved quality of life for patients with chronic illnesses, bridge the gap in knowledge about transition within the context of inpatient to Palliative Care, and safeguard accountability of quality care for patients with chronic illnesses. This will improve early patient education, referral and advocacy, as well as equip nurses to communicate with patients, families and caregivers appropriately and with empathy, thus providing dignity at the end of life.

Benefits to Science and Society: My research will generate new knowledge for the body of nursing about the patient experience, identify gaps in Palliative Care research, and improve nursing practice of Palliative Care. I believe this will inspire a more robust nursing curriculum so that nurses are better equipped to care for and educate patients with chronic illnesses. My overarching goal is to improve patient outcomes, reduce 30-day hospital readmission rates, improve patients' quality of life, and ensure dignity for each patient with a chronic illness.

Personal Interests: When I am not working, reading or writing papers, I enjoy cooking, grilling, and putting outfits together in my closet.

ARCS Award: Being an ARCS Scholar is an honor. I am inspired to be more resilient and to continue to pursue my goal of a doctoral education in nursing. This award acknowledges my hard work and encourages me to focus on my research and to constantly find ways to become a better nurse scientist in order to improve patient outcomes. I am both honored and grateful for the opportunity to represent The University of San Diego.

BROOKE HALEY RAKES

University of San Diego

Hahn School of Nursing and Health Science

Concentration: Philosophy of Nursing

Specialization: Neonatal Outcomes

Donor: Reuben H. Fleet Foundation Fund

As a nurse working in the Neonatal Intensive Care Unit (NICU) for 7 years I am passionate about improving outcomes for pregnant/post-partum women, infants, and their families. The clinical questions and challenges I have observed at the bedside have compelled me to obtain a research doctorate. My research focuses on infants with suspected Hypoxic-ischemic encephalopathy (HIE), a type of neurological dysfunction resulting in devastating long-term neurological morbidity and/or mortality. Through my research, I hope to improve infant outcomes by generating new knowledge related to HIE identification, treatment initiation, and management.

Degrees: M.S. in Nurse Executive Leadership, University of San Diego; B.S. in Nursing, Point Loma Nazarene University

Awards and Honors: Terrance and Barbara Caster Institute of Nursing Excellence scholarship recipient 2020-2021; Nurses Educational Funds, Inc. combined Barbara L. Tate & Evelyn J. Barclay scholarship recipient 2020-2021; Dean's PhD Research Scholar Award, University of San Diego 2020-2021

Current Research (expanded description): I will continue to place infants and families in the center of my research to improve outcomes for our most fragile patients. Infants with suspected HIE require urgent or emergent delivery, resuscitation, and stabilization. Established protocols include initiation of therapeutic hypothermia (TH), transfer to the neonatal intensive care unit (NICU), and if necessary, transfer to a hospital with a higher-level NICU. Nurses play a central role in the identification of HIE infants as well as TH initiation and management. Deeper understanding of timing may optimize TH and infant outcomes. Therefore, the proposed research will examine retrospective data extracted from electronic health records (EHR) of HIE infants receiving TH therapy to examine the relationships among neonatal clinical characteristics, maternal factors, TH initiation time (minutes/hour of life), time to target temperature (minutes/hour of life to 33.5°C), and short-term infant outcomes (neonatal seizures, brain injury).

Benefits to Science and Society: As part of the next generation of nursing scientists, I will shape the future of nursing through my program of research. Through my research, I will advance nursing science and utilize research findings to inform and improve neonatal neurological outcomes and health care services in Neonatal Intensive Care Units. I will give back through supporting and mentoring future nurses as they further contribute to the art and science of nursing.

ARCS Award: The PhD will provide knowledge and skills required to achieve my goals. The USD doctoral curriculum, and support by faculty and ARCS, will facilitate my growth in nursing science, policy, research methodology and statistics. Thanks to the ARCS financial award, I am able to reduce my work commitment and focus more on my program, research interests, and family.