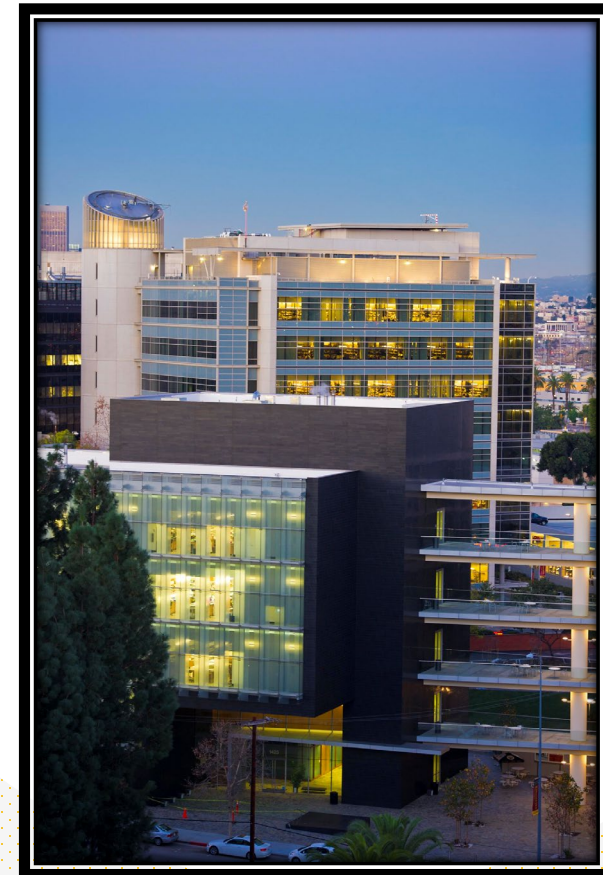


# USC Graduate School

*DIA JumpStart*



**Undergraduate Research Opportunities  
Summer 2021**

# Diversity, Inclusion, and Access JumpStart Program Overview

- USC's Graduate Initiative for Diversity, Inclusion, and Access (DIA) aims to provide a pathway to PhD programs for undergraduate students by providing academic and financial support and professional development opportunities. DIA JumpStart works with USC schools and programs to invite diverse candidates from outside institutions to apply for 10-week summer research opportunities in various PhD disciplines. Available opportunities range from lab-based research to mentored participation in other types of faculty projects.
- Summer 2021 program dates are **Tuesday, June 1 through Tuesday, August 10**, unless otherwise noted by the research opportunity. If COVID-19 precautions remain in place through late spring, students should be prepared for a hybrid program that begins online and transitions to campus as conditions permit. Should a return to campus not be possible, the program would be fully virtual as it was in Summer 2020.

## PROGRAM BENEFITS

- The Graduate School provides JumpStart scholars with a stipend. Health coverage is available for the on campus program. Those who successfully complete the program will also have their application fees waived if they apply to USC PhD programs.
- To complement their summer research experience, JumpStart scholars will participate in Graduate School sponsored sessions led by USC faculty and staff. Sessions include graduate admissions, PhD funding, PhD student life, and more. JumpStart scholar's research will be featured in an end of summer poster symposium.

# Diversity, Inclusion, and Access JumpStart Program Application

## APPLICATION

- Students completing their sophomore or junior year at outside institutions prior to the summer are encouraged to apply.
- Applications are evaluated by the research program, or faculty, and the Graduate School. Applicants may be contacted for an interview.
- Applications for research positions through DIA JumpStart are currently available at <https://provost.sma.usc.edu/prog/DIAJumpStart/>

## APPLICATION DEADLINE: **Friday, April 2, 2021**

- As part of the application, students will be required to submit:
  - Personal statement and research interests
  - Short statement on academic and professional goals
  - Resume or CV
  - Current transcripts (unofficial or official)
  - One (1) letter of recommendation from faculty

## FOR MORE INFORMATION

- Questions about DIA JumpStart should be sent to [GradDIA@usc.edu](mailto:GradDIA@usc.edu).
- Additional information can also be found by visiting <http://graduateschool.usc.edu/dia/>

# Biokinesiology & Physical Therapy



- **Pediatric Physical Therapy Research Experience**
- **Perinatal Health Biomechanics Research**
- **Effects of Gait Biofeedback on Walking Pattern Post-Stroke**
- **Neuro-Informatics and Neuro-Therapeutics for Chronic Pain**
- **Examining the Role of Diet on Responses to Acute High-Intensity Interval Training**
- **Recovery and Compensation During Walking in People Post-Stroke**
- **Effectiveness of an Online Mindfulness Intervention for Stroke Survivors and Their Caregivers**

# Pediatric Physical Therapy Research Experience

## Stacey Dusing, Visiting Associate Professor

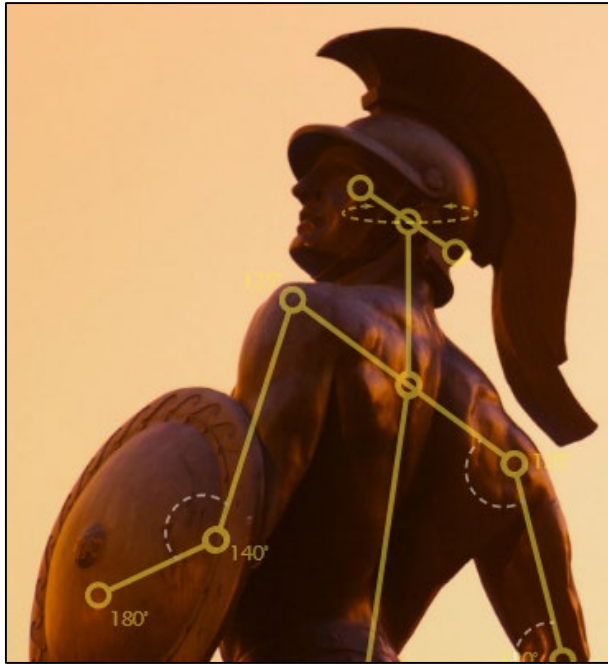
### Division of Biokinesiology and Physical Therapy

- The SIT-PT clinical trial is a National Institute of Health funded multi-site clinical trial lead by Stacey Dusing in the Biokinesiology and Physical Therapy. Infants 7-20 months of age with motor disabilities are enrolled and randomized to one of two interventions, MORE-PT or START-Play.
- Both interventions are based on well defined principles and are video recorded for regular monitoring of the accuracy of the intervention provided or fidelity.
- Each participant is also assessed 4 times over 12 months to quantify changes in motor, cognitive, and language development. Undergraduate researchers are instrumental in video taping these intervention and assessment session when complete by the research team
- The visits are either completed in a research lab on the HSC campus or in the family home. As the student skills progress they may be trained to help administer questionnaires and prep equipment for the visits.



**Preferred Majors: Neuroscience, Psychology, Kinesiology, Pre-Physical Therapy**

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**Preferred Majors: Kinesiology, any Engineering, Computer Science, Mathematics, Health Sciences**

## **Perinatal Health Biomechanics Research** **Kate Havens, Assistant Professor of Clinical Physical Therapy** **Division of Biokinesiology and Physical Therapy**

- Approximately 4 million women give birth in the United States each year. About half of these individuals have lower extremity pain of the knee, hip, or ankle, and about half have low back pain or pelvic girdle pain during their pregnancy. During the months after birth, mothers face large changes in their musculoskeletal, hormonal and psychological states, and for many, pain continues. In order to effectively inform treatment interventions for pain reduction in this postpartum population, we must first understand the physical demands of motherhood, including transporting, lifting, and feeding baby.
- The Perinatal Health Research Group aims to characterize the biomechanics of postpartum mothers during common infant care tasks. The DIA Jumpstart scholar will be introduced to all aspects of a career in research and critical thinking during their tenure. The scholar will be able to explore options of ongoing projects to work on, depending on the ability to actively collect laboratory data given the COVID-19 pandemic
- The Jumpstart scholar will work closely with a faculty mentor and will be expected to report weekly on the progress of the project during lab meetings. Scholars will function as part of the Perinatal Health Research team and will learn the responsibility of themselves and colleagues, ethical standards in laboratory research, problem solving, and laboratory procedures. They may have the opportunity to present their research at internal, regional, or national conferences.



## Effects of Gait Biofeedback on Walking Pattern Post-Stroke

### Kristan Leech, Assistant Professor Division of Biokinesiology and Physical Therapy

- Stroke is a leading cause of long-term disability around the world. After a stroke, older adults commonly exhibit gait dysfunction (e.g., slow, unstable, asymmetric walking), which is the top patient-reported rehabilitation target. Students will have the opportunity to work on an innovative research project that aims to determine the optimal parameters of biofeedback-based gait training in individuals with chronic stroke
- Specifically, we will provide visual biofeedback of different aspects of walking (e.g., the length of each step, the magnitude of knee flexion when the leg swings forward, etc) to people post stroke and identify the biofeedback variable that elicits the largest reduction in walking asymmetry.
- We expect to show that biofeedback of paretic propulsion (how hard someone pushes off from the ground with their foot while walking) will lead to the greatest reduction in walking asymmetry. Analysis of biomechanical data (motion capture, ground reaction forces, etc) will be used to test our working hypothesis.

**Preferred Majors: Biomedical Engineering, Neuroscience, Computer Science, Physiology, Pre-Physical Therapy**

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# Neuro-Informatics and Neuro-Therapeutics for Chronic Pain

## Jason Kutch, Associate Professor

### Division of Biokinesiology & Physical Therapy



- Dr. Kutch directs the Applied Mathematical Physiology Laboratory (AMPL) in the Division of Biokinesiology and Physical Therapy at USC. Research in AMPL uses state-of-the-art neuroimaging, non-invasive brain stimulation, and computational techniques to understand how brain dysfunction contributes to chronic pain. AMPL is currently funded by the National Institutes of Health (NIH) to perform a randomized controlled trial (RCT) of repetitive transcranial magnetic stimulation (rTMS) to treat chronic pain.
- Projects in the lab involve advanced neuro-informatic approaches to identify brain dysfunction and track improvements in brain function with rTMS treatments, as well as advanced non-invasive rTMS using MRI-guided targeting.
- The purpose of this program is to provide the student with experience in both neuroimaging data processing and non-invasive brain stimulation. If the program is conducted virtually, the student will meet with the faculty host and supervisor to learn how to perform basic neuroimaging processing tasks, explore how brain function is affected by non-invasive stimulation, and synthesize literature. If the program additionally has an in-person experience, the student will be able to observe treatment and neuroimaging sessions as part of our NIH-funded trial. The overall goal of the program is to enable the student to propose a PhD project that would improve our ability to positively impact the lives of patients living with chronic pain.

**Preferred Majors: Applicants ideally should have a background in Neuroscience, Mathematics, Engineering, or related discipline**

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# Examining the Role of Diet on Responses to Acute High-Intensity Interval Training

## George Salem, Associate Professor

### Division of Biokinesiology and Physical Therapy

- Inflammatory responses to long duration, exhaustive exercise have been well studied, however, little research has examined the effects of high-intensity interval training (HIIT). Research into supplement use during long duration exercise has also been examined, but the effects of habitual diet have not been well categorized in exercise research. The goal of this project is to examine how novel bouts of HIIT running and cycling affect the inflammatory response to exercise in healthy, recreationally active young adults.
- This study will allow us to directly compare how running and cycling affect circulating biomarker availability when prescribed in a HIIT protocol. The study setup will also allow us to specifically separate participants with two different diets: omnivore and vegan. This work will contribute to our knowledge of the inflammatory and muscle response to different modes of training while also determining if diet is something that should be considered and controlled for when researchers perform exercise intervention studies.
- Thirty young, healthy, recreationally active young adults will be recruited to participate in the study: 15 for the omnivore diet group and 15 for the vegan diet group. Participants will visit USC Musculoskeletal Biomechanics Research Laboratory/Clinical Exercise Research Center for 6 data collections. Visit 1 will involve  $HR_{max}$  testing, DEXA scanning, and familiarization with the HIIT protocol. Visit 2 will involve  $HR_{max}$  testing on the opposite testing modality. Data collection will occur on visit 3 and will consist of a blood draw after overnight fasting followed by completion of either the running or cycling HIIT protocol.
- Upon completion of the exercise protocol, another blood draw will be taken. The participant will then remain in the lab for 1 hour for a final blood draw. During the 1-hour break, the participant will fill out a 24h food recall. The participants will then return to the lab for visit 4 at the same time the next morning for a 24h post exercise blood draw after an overnight fast. Visits 5 & 6 will have the same setup as visits 3 & 4 performed after a 1-week washout period. The only difference will be the exercise protocol they perform. A questionnaire will be given about the participant's level of muscle soreness after the exercise bout as well as during subsequent days. Blood samples will be analyzed for cytokines, chemokines, tissue damage biomarkers, and oxidative stress. Additionally, shoe insoles will be used to obtain impact forces, rate of force development, and peak loading of the foot during each HIIT activity.

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**Preferred Majors: Biomedical Engineering, Kinesiology, Biology, Exercise Science**

# Recovery and Compensation During Walking in People Post-Stroke

## Natalia Sanchez, Assistant Professor of Research Division of Biokinesiology and Physical Therapy

- Cerebrovascular accident or stroke-induced lesions to the nervous system lead to a myriad of walking deficits. Improving walking function in survivors of stroke is a common goal of many rehabilitation interventions to achieve improvements that are meaningful, including increased independence and re-integration, and prevention of future complications due to sedentary behavior. However, variations in the combination and magnitude of post-stroke walking deficits results in different patterns of recovery and compensation between individuals.
- This research project aims to provide precise quantification of individual-specific deficits to better inform clinical practice in the design of patient-specific interventions. The scientific questions we intend to answer are: 1) Can we differentiate between recovery and compensation of locomotor behavior in individuals as they transition in time from the acute to the chronic phase after the stroke event? 2) When identifying patterns of locomotor deficits, are there some patterns that are generalizable across the entire post-stroke population, or are deficits specific to each individual? To achieve these objectives, we will acquire longitudinal gait (i.e. locomotion) data in individuals early after stroke, in the acute phase, and follow them up later into the chronic phase after stroke.



**Preferred Majors: Biomedical Engineering, Computer Science, Computational Neuroscience, Mechanical Engineering, Neuroscience**

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# Effectiveness of an Online Mindfulness Intervention for Stroke Survivors and Their Caregivers

## Carolee Winstein, Professor Biokinesiology and Physical Therapy



- Stroke is a leading cause of disability worldwide. It can lead to physical, psychological and cognitive impairments impacting activity and social participation. One important consequence of stroke is depression and anxiety. Among stroke survivors, the prevalence of anxiety and depression is much higher than the general population. The considerable psychosocial impact of stroke extends to spouse and family members, and close friends taking the role of caregivers, with also higher anxiety and depression than peers.
  - Previous work suggests that mindfulness delivered in an online format is promising for both individuals with neurological disorders and caregivers. Mindfulness is a promising approach to reduce stress, improve coping with the facets of a chronic disorder, and improve psychological well-being. Our project aims to determine the impact of a 3-week online mindfulness intervention compared to a control group on quality of life and psychological well-being in stroke survivors and their caregivers. We hypothesize that participants in the mindfulness group will show greater improvements in their quality of life and psychological well-being than the control participants.
- Preferred Majors: Neuroscience, Health/Medical Preparatory programs, Psychology, Exercise Science, Nursing or Biology**
- Stroke survivors and their caregivers will be randomly assigned to either a mindfulness intervention or a waitlist control. Participants in the mindfulness group will be guided on how to navigate the mindfulness platform using their own device (computer, iPad or mobile phone). For both groups, a blind assessor will administer an assessment battery about psychological wellbeing, sleep quality and the impact of stroke. The assessment battery will be done at baseline, post-intervention, and at a 1-month follow-up. The mindfulness intervention will last 3 weeks and will be offered entirely online. Participants will be instructed to connect to the platform and accomplish daily mindfulness exercises a minimum of 5 days per week to optimize participation. Educational information about mindfulness will also be provided and 5 topics will be explored in-depth. Participants assigned to the waitlist control group will be informed that they will receive the mindfulness intervention 3 weeks after enrollment.
  - This study will help to understand the role of mindfulness exercises delivered remotely and the potential benefit of the intervention for stroke survivors across a wide range of disability level and their caregivers. This study, if shown to be efficacious, provides a beneficial option for stroke survivors living in the community, without the need for in-person visits. Remote interventions that target psychological well-being are much needed during this global pandemic along with recent advances that improve access to services through telehealth and telemedicine.

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# Biological Sciences

- **Investigating the Role of Bacteria in the Maintenance of Cnidarian-Algal Symbioses**
- **Do ITIH Proteins Influence Fertilization Success?**
- **Role of Glucokinase in the Taste Cells in Sugar Appetite**

# Investigating the Role of Bacteria in the Maintenance of Cnidarian-Algal Symbioses

## Carly Kenkel, Gabilan Assistant Professor Biological Sciences

- Coral reefs are three dimensional ecosystems that provide habitat for nearly 25% of marine species. The morphology a coral colony is vital to the reef as an ecosystem and for some species, varying growth form may be used as a strategy to help a coral survive. The 3D structure of corals has been hard to quantify in the past but recent technologies in 3D model provide new ways to assess coral morphology like never before. The Kenkel lab employs 3D photogrammetry to document restored *Acropora cervicornis* colonies in the Florida Keys National Marine Sanctuary (FKNMS). The Kenkel Lab will be producing hundreds of 3D models of coral colonies to track the growth of individuals over multiple years at numerous reef sites. While long term morphological changes over 1 year have been assessed, the shorter and longer-term growth patterns of these restored *Acropora cervicornis* colonies is yet to be understood.
- Students will collect trait data from 3D coral models in the software MeshLab. Then, students will use the coral trait data to assess the growth and geometry of colonies over time and space to identify patterns among reef sites in the FKNMS. This project would be open to additional analyses or other avenues of exploration. All work can be completed remotely and Zoom meetings will be used for discussions and more direct training. There is potential for in person training in 3D photogrammetry assuming it is safe to do so. After the initial training, the 3D model work can be completed independently, and weekly meetings can be used to check progress and work through data analysis and data visualization of final results. For local students, the opportunity to continue work on this and related projects into the future may be possible.



**Preferred Majors:  
Biology or related**



## Do ITIH Proteins Influence Fertilization Success? Matt Dean, Associate Professor Department of Biological Sciences

**Preferred Majors: No required major... just lots of curiosity and common sense**

- Studies of fertilization biology often focus on sperm and egg interactions. However, before gametes interact, mammalian sperm must pass through the cumulus layer; in mice, this consists of several thousand cells tightly glued together with hyaluronic acid and other proteins.
- To better understand their role, we recently performed proteomic experiments on cumulus cells. Several proteins of the ITIH family seem to play an important role in stabilizing the cumulus layer, and sperm might need to degrade this protein in order to fertilize eggs.
- We propose to test whether sperm from genetically distinct strains of mice vary in their ability to break down ITIH proteins, and if so, what effect that has on fertilization success. This work is rooted in evolutionary and reproductive biology and genetics.

[\*\*MORE\*\*](#)

# Role of Glucokinase in the Taste Cells in Sugar Appetite

**Lindsey Schier, Assistant Professor**  
**Department of Biological Sciences**



Our lab seeks to understand the neurobiological mechanisms that contribute to overeating and metabolic disease. Specifically, we examine how nutrients are detected along the gastrointestinal tract and how that sensory information is relayed and processed in the brain to guide dietary choice and appetite. For nearly two decades, sugars were thought to bind to a single receptor in taste cells and elicit a cascade of cellular and neural events that ultimately drive ingestion and elicit rewarding sensations.

- However, recent data from our lab indicate that glucose additionally engages an alternative sensor, associated with the phosphorylating enzyme, glucokinase. This project will combine gene silencing tools to selectively knockdown glucokinase expression in taste buds and sophisticated behavioral assays to measure glucose taste detection and preference in mice. A second aim of this project will examine how metabolic diseases, such as diabetes, influence glucokinase expression in the mouse taste tissue, using real time quantitative polymerase chain reaction (PCR).

**Preferred Majors: Biology, Psychology, Neuroscience**

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# Chemistry

- **Snapshots of Chemistry: Visualization at the Molecular Level**





## Snapshots of Chemistry: Visualization at the Molecular Level

**Chemistry Faculty** offer broad selection of research groups in alternative energy, chemical physics, chemical biology, drug discovery, inorganic, materials/polymers, nanoscience, organic, physical, and theoretical chemistry

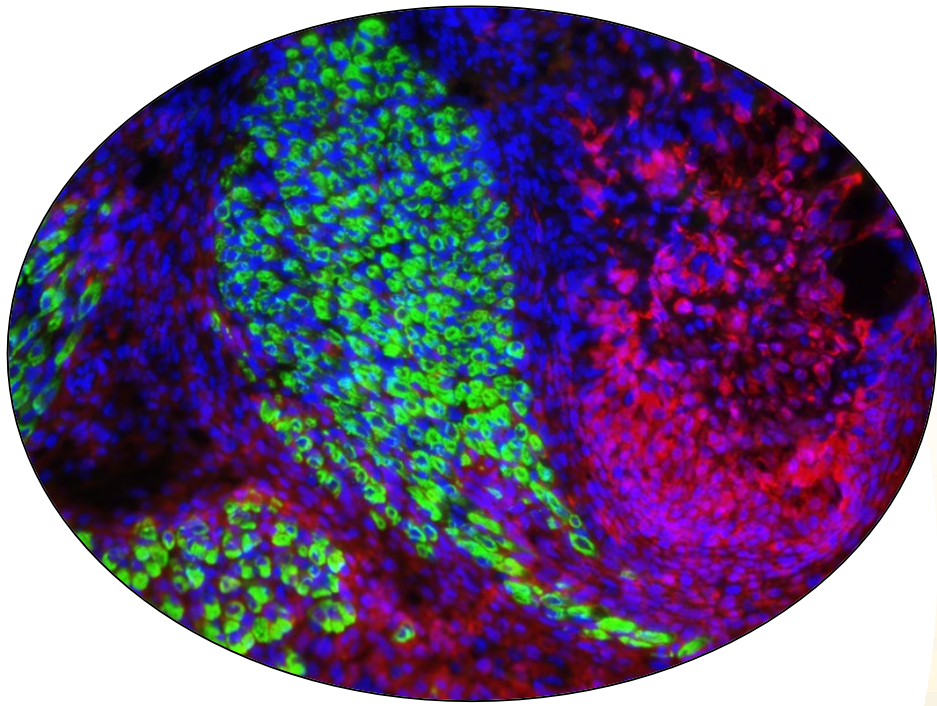
- We use the term "Snapshots of Chemistry" to emphasize our focus on gaining insights on key chemical features of molecular processes via visual images. Research projects will cover a broad range of topics, spanning from femtosecond time-resolved observations of transient events to synthesis of novel drugs, development of nanostructures and catalysis in energy research, biochemical and structural investigations of proteins and nucleic acids, and theoretical investigations using advanced algorithm and state-of-the-art computer graphics and multimedia capabilities.
- You will work one-on-one in a lab with a faculty advisor and graduate student mentor. We integrate student research activities with weekly meetings that feature professional development courses, showcase student research presentations, and highlight the breadth of chemistry across traditional and interdisciplinary areas. Included will also be tours of local research facilities such as the NASA's Jet Propulsion Laboratory, Loker Hydrocarbon Research Institute and team building activities. The summer will culminate with a poster session, where you will display your summer research and discuss it with Chemistry faculty and graduate students.

**Preferred Majors: Chemistry, Biochemistry**



## **Craniofacial Biology**

- **Research in Craniofacial Birth Defects and Tissue Regeneration**
- **Rebuilding Lost Tooth Enamel Through Development of a Hydrogel**



**Preferred Majors: Biological Sciences (such as Microbiology, Cellular or Molecular Biology), Biomedical Engineering, Biochemistry, Genetics, Chemistry, Bioinformatics, or other related STEM field**

## Research in Craniofacial Birth Defects and Tissue Regeneration

### Yang Chai, University Professor

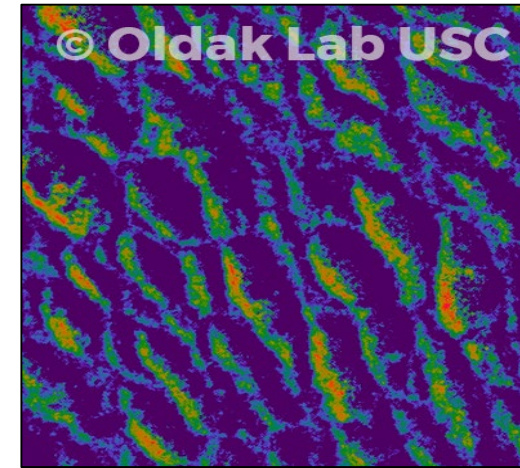
### Ostrow School of Dentistry/Center for Craniofacial Molecular Biology

- The human face represents the unique identity each of us present to the world. What's more, the face and skull house many of our important sensory organs, our brain, and the entry points to the systems by which we breathe, eat, and speak. Craniofacial biology is an interdisciplinary field that seeks to understand how these delicately interconnected systems develop in normal circumstances and how this development can go wrong, producing birth defects like cleft lip/palate. The USC Center for Craniofacial Molecular Biology ([ccmb.usc.edu](http://ccmb.usc.edu)) on the Health Sciences Campus is consistently recognized as one of the world's top centers in the field, led by Director and University Professor Yang Chai.
- The Chai Lab ([chailab.usc.edu](http://chailab.usc.edu)) has a strong track record of pioneering research investigating the molecular and cellular regulatory mechanisms of craniofacial development, with particular emphasis on congenital birth defects such as cleft palate and skull malformations. Lab members also conduct basic and translational research involving mesenchymal stem cells from *in vitro* studies to large animal models, necessary steps in the development of stem cell-based regenerative therapies for both soft and hard tissues. Dr. Chai is also currently Co-PI of the FaceBase Consortium ([facebase.org](http://facebase.org)) and the Center for Dental, Oral & Craniofacial Tissue & Organ Regeneration (C-DOCTOR.org), both of which present unique opportunities for students to be involved in basic and translational research in craniofacial morphogenesis and regeneration.

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# Rebuilding Lost Tooth Enamel Through Development of a Hydrogel

**Janet Moradian-Oldak** Professor of Dentistry, Biomedical Sciences, Herman Ostrow School of Dentistry of USC  
Professor of Biomedical Sciences & Bioengineering, Viterbi School of Engineering



- Even though dental enamel is the body's hardest material, if it wears away as the result of cavities, acidic food or drinks or overbrushing, it doesn't regenerate. The Oldak Lab was recently awarded multiple grants for: a) studying the structure and function of proteins that are involved in forming and mineralizing tooth enamel and b) the development of a patented hydrogel that can regrow an enamel-like surface on teeth, preventing deep decay by addressing lesions early to rebuild the lost enamel. The patented hydrogel is based on chitosanamelogenin peptide. Amelogenin is a protein that animals and human use to build dental enamel. The Oldak lab has made significant contributions to fundamental research on biological mineralization and they are translating these finding into the clinic.
- The JumpStart scholar working on this project will assist in everyday functioning of the research lab, which continues to test how this hydrogel works for enamel and dentin remineralization and to understand the basic structure of tooth enamel. Students will have the opportunity to gain hands-on experience in protein/peptide chemistry, biomaterial synthesis, and molecular biology techniques including gel electrophoresis, high performance liquid chromatography, electron microscopy, in vitro cell culture techniques as well as enamel mineralization and crystallization experiments.

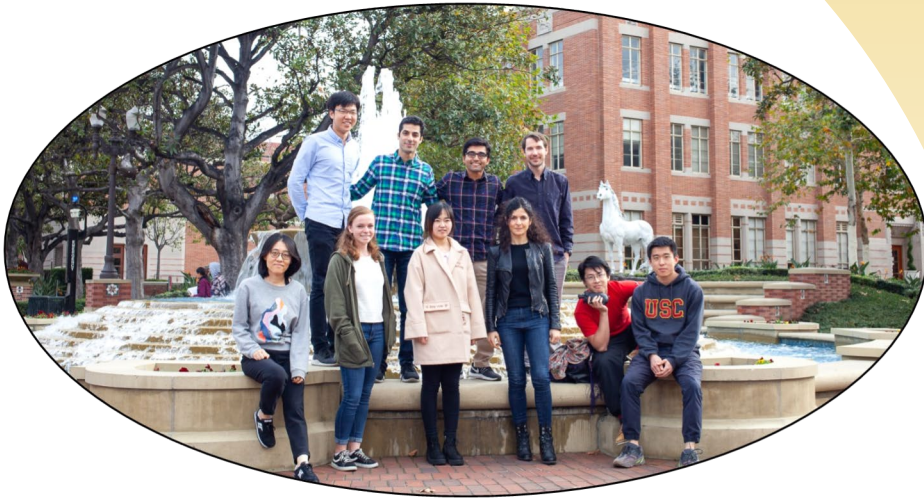
**Preferred Majors: Biological Sciences, Biomedical Sciences or Engineering, Biomaterials, Chemistry or other related field**

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# Engineering

- **The Physics of Animal Behavior**
- **Algorithms and Applications of Internet of Things, Blockchain and AI**



# The Physics of Animal Behavior

## Eva Kanso, Zohrab A. Kaprielian Fellow in Engineering and Professor Aerospace and Mechanical Engineering

**Preferred Majors: Physics, Mathematics, Mechanical Engineering, Computer Science**

- We look at the physics of animal behavior and aim to translate it into engineering principles for soft robotic systems. We develop mathematical models that explain the mechanisms underlying fish swimming, fish schooling, bird flying, as well as the behavior of microscopic organisms.
- You will work closely with Professor Kanso and another graduate student in the lab on a specific problem that we define together based on your interests.
- You will learn to use Matlab for data processing, model analysis, and data visualization. You will also learn basic mathematical tools from linear algebra and ordinary differential equations.
- Please check out our lab at <https://sites.usc.edu/kansolab/> or contact Professor Kanso at [Kanso@usc.edu](mailto:Kanso@usc.edu) if you have any questions or need more information about our lab, how we work, and what we work on.





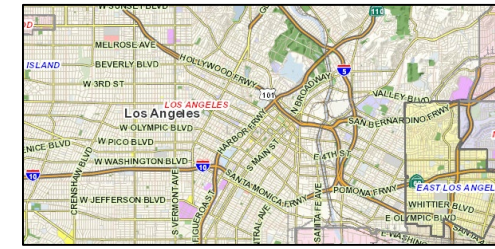
## History

- **The Chinatown History Project**



# The Chinatown History Project

## William Deverell, Professor History, Spatial Sciences & Environmental Studies



- Los Angeles's Chinatown has been a city within a city for over 150 years, a destination for residents and tourists and a neighborhood vulnerable to the destructive acts of the dominant culture. The multifaceted Chinatown History Project utilizes digital humanities to access a reconstructed version of this historic place and encounter the life and labor histories of people who shaped a city, state, and nation – and invites further thought on contemporary understanding of a modern, pluralistic society.
  - Following the 1869 completion of the transcontinental railroad, Chinese rail workers and immigrants established businesses and residences in central Los Angeles near the historic Los Angeles Plaza. By the 1880s, the Chinatown community had expanded east of Alameda Street to land bordered by Macy Street (later renamed Cesar E. Chavez Avenue). In the 1910s, property that encompassed much of Chinatown and adjacent industrial land was identified as a site for a union passenger terminal to be shared by the three transcontinental carriers of the era.
  - By the early 1930s, following decades of litigation, officials finalized plans to build the terminal in Chinatown. That decision required the acquisition of land, relocation of residents, and razing of all structures. Demolition of Chinatown began in December 1933. The grand opening of the Los Angeles Union Passenger Terminal took place in May of 1939.
- Preferred Majors: no preference though humanities disciplinary training would be helpful**
- This project is devoted to recalling, memorializing, and analyzing that environment and those who moved and created new neighborhoods so that the last major metropolitan rail depot constructed in the nation could rise from the neighborhood that was once theirs. This is one moment in the city's long history of racial antagonism toward people and communities of Asian descent. While well known in the Chinese and Chinese American community (especially in nearby "New Chinatown," constructed as the first Chinatown fell), the history of this destruction, displacement, and rebirth is not widely known by broader public or scholarly audiences. This project springs from our team's devotion to study, remember, and in a sense recover that earlier landscape and the people within it (and to share that recovery as widely as possible).
  - The project has its origin in our encounter with nearly 150 historic photographs taken just before demolition and displacement took place in the early years of the Great Depression. Utilizing those images (which are meticulously addressed so as to allow GIS work), our Chinatown History Project brings humanities research – collected in the database described below – together with new techniques and technologies in digital humanities and augmented reality to display research findings and to invite anyone to pursue additional humanities research through the assembled historical data

# Linguistics

- Individuating and Comparing Objects and Events





## Individuating and Comparing Objects and Events

### Alexis Wellwood, Associate Professor Philosophy and Linguistics

- The USC Meaning Lab conducts NSF-funded research with children and adults, studying the relationships between language, thought, and perception. Our research thus lies at the intersection of the philosophy of language and mind, linguistics, and cognitive psychology. Presently, our research focuses on the representation of objects and events as a particularly fruitful case study.
- The JumpStart student will take a high level role in one of the lab's research projects, including working closely with the PI and her graduate assistant on literature review, study design and implementation, programming studies for running in an online format, analyzing and interpreting results, and preparing presentations both to the lab and to the JumpStart community explaining the results and significance of the research.
- The student will gain significant experience in all aspects of the research process in a social-behavioral lab, from study conception to dissemination. This includes guided literature review and writing, training and exercise in basic programming, as well as statistical and data visualization methods. The student will gain insight into research that cross-cuts traditional disciplinary lines, enjoy frequent interaction with the Principal Investigator of a research lab, and help to lay the foundations for a cutting-edge research paper.

**Preferred Majors: Linguistics, Cognitive Science**



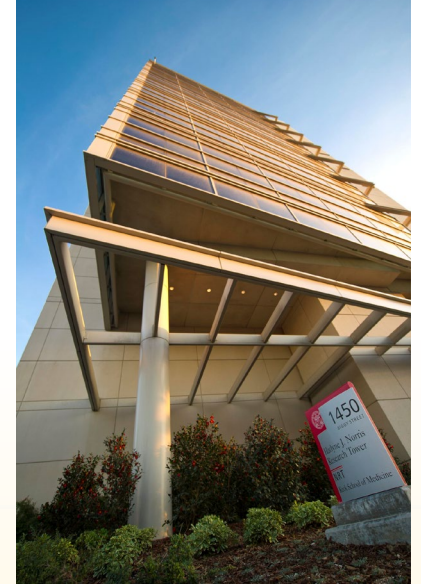
## **Norris Comprehensive Cancer Center**

- **Development of a Powerful New Organoid Model to Study Lung Adenocarcinoma**

# Development of a Powerful New Organoid Model to Study Lung Adenocarcinoma

Ite Offringa, Associate Professor of Surgery & Associate Dean for Graduate Affairs, Keck School of Medicine

- Lung cancer kills more Americans than the other top three cancers combined (colorectal, pancreatic and breast). Lung adenocarcinoma (LUAD) is the most common lung cancer subtype and also the most common lung cancer in never smokers and women. It arises in the alveoli or air sacs of the lung, which consist of alveolar epithelial cells. There are a few targeted therapies that specifically treat LUAD tumors with certain mutations, such as mutations in the epidermal growth factor receptor (*EGFR*) gene. Such therapies are much less toxic than conventional chemotherapy. However, the cancer usually becomes resistant by acquiring new mutations and then comes back, requiring “second line” and even “third line” therapies to treat the resistant cells. It would be very useful to have a tissue culture model for LUAD in which we can mimic the cells developing resistance, characterize the basis for resistance and screen for new new drugs.
- To do this, one would need to be able to grow alveolar epithelial lung cells in culture. The Offringa lab recently developed a method to successfully grow cultures of human alveolar epithelial cells. Using remnant transplant lungs, we have established cell lines from three (unidentified) individuals. The cells grow rapidly as a flat layer in petri dishes, allowing them to be easily cultured and genetically manipulated. When placed in 3-dimensional culture with fibroblasts (support cells), the cells form organoids reminiscent of alveoli. We are in the process of engineering these organoids by introducing different cancer driver mutations. The goal is to develop mini-tumors on the organoids that can be individually monitored. This innovative model will be a powerful tool to study the development of lung adenocarcinoma and the molecular basis for acquired resistance to targeted therapies. We will also use it to screen for new drugs for treatment of drug-resistant lung adenocarcinoma.



**Preferred Majors:  
Biology, Chemistry,  
Biomedical Engineering  
or student with  
scientific focus**

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# Occupational Science Occupational Therapy

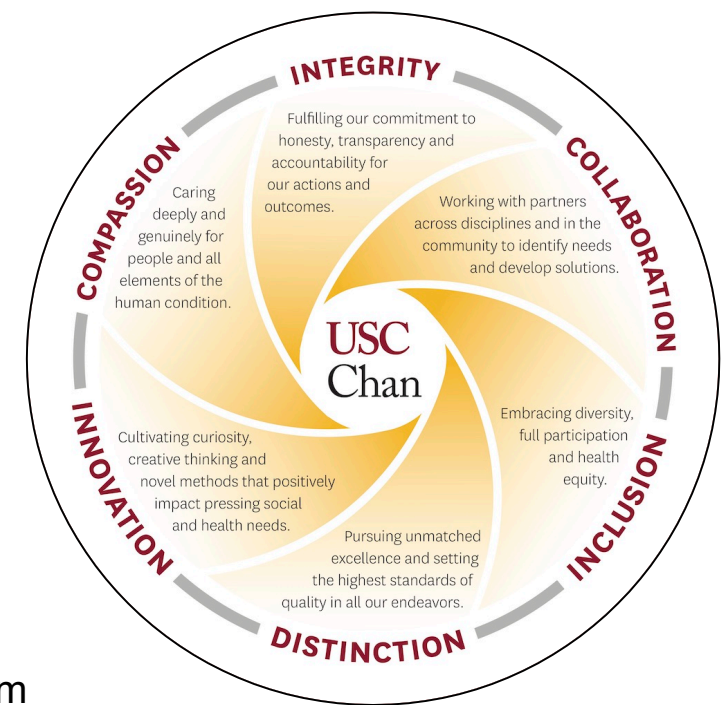


- **How Do Girls Come to Get an Autism Diagnosis?**
- **The A-Z Lab at the Brain and Creativity Institute**
- **Neonatal Intensive Care Unit Therapy Research Laboratory**

# How Do Girls Come to Get an Autism Diagnosis?

## Amber Angell, Assistant Professor USC Chan Division of Occupational Science and Occupational Therapy

- This mixed methods study explores the experiences of families who have a girl diagnosed with autism spectrum disorder. Girls are an understudied and underserved autism population at risk for misdiagnosis and delayed diagnosis. Thus, this study aims to understand how girls with autism receive a diagnosis and subsequent services, exploring potential barriers to and facilitators of these processes. We are particularly interested in learning about the experiences of Latina and African American girls with autism and their families, as these are populations that are understudied in research.
- This study will consist of 1) a questionnaire and 2) audio recorded qualitative interviews with parents/caregivers of girls with autism (age 8 and under) to identify the age at diagnosis, factors that delayed or facilitated the diagnosis, types of professionals the girls interacted with, potential misdiagnoses, as well as the services they received and potential barriers to obtaining them. The findings of this study have potential implications in reducing disparities in diagnostic processes and service provision for girls with autism spectrum disorder.



**Preferred Majors: Any background**

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# The A-Z Lab at the Brain and Creativity Institute

## Lisa Aziz-Zadeh, Associate Professor Occupational Therapy & Brain and Creativity Institute



- Assist in everyday functioning of a research lab, which uses neuroimaging techniques to explore questions of social cognitive neuroscience. The current project looks at sensory functioning, gut microbiome, and brain activity, and their potential involvement in processing emotions, empathy, and social communication in Autism Spectrum Disorder.
- Research Assistants are required to maintain the RedCap data basing system, ensure data quality control, assist in recruiting, communicate with collaborators and participant families, and assist in acquisition of behavioral and neural data.
- This position requires excellent attention to detail, organization, and an understanding of the study protocols, measures, and reporting requirements. Working directly with participants and families from clinical populations to acquire paper and video data will require excellent communication and interpersonal skills.
- Learning Outcomes: Deeper understanding of neuroscience, Autism Spectrum Disorders, behavioral and psychological testing, and MRI acquisition. Experience with the inner workings of and R01 level study in a research lab setting. Clarity on the process and information regarding potential next steps in higher education, and success within graduate programs.

**Preferred Majors: any background in Psychology, Neuroscience, Occupational Therapy, Computer Science, Human Biology or related fields**

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## Neonatal Intensive Care Unit Therapy Research Laboratory

**Roberta Pineda, Assistant Professor**  
**USC Chan Division of Occupational Science and  
Occupational Therapy**  
**Department of Pediatrics, Keck School of Medicine**

- The NICU Therapy Lab investigates factors associated with cerebral alterations and adverse neurodevelopmental outcome in high risk newborn infants, specifically infants born prematurely. Early factors that can impede function and are being investigated include the environment (low stimulation environments as well as higher stimulation environments), stress, pain, medical complications and interventions, parenting, brain injury and prenatal exposures. The NICU Therapy Lab has developed a sensory intervention,
- The Supporting and Enhancing NICU Sensory Experiences (SENSE) program, which is supported by current evidence and aims to engage parents in providing age-appropriate, positive sensory exposures to their infants each day of NICU hospitalization. This program is being implemented in hundreds of NICUs across the United States and abroad.
- The NICU Therapy Lab has also developed the Neonatal Eating Outcome Assessment, which assesses feeding skills in preterm and high-risk infants. Other research interests include neurobehavioral assessment of preterm infants and early identification of developmental challenges, neonatal feeding, neurodevelopmental outcomes, empowering parents and early intervention services.
- The NICU Therapy Lab is a new addition to USC, after being at Washington University for 12+ years. Through longitudinal data that has been collected over a long period of time, there are multiple opportunities for student-driven inquiry that aligns with this topic area and available cohort data. Along with other students in the NICU lab, DIA Jumpstart students will engage in active learning about OT and medical practice in the NICU setting, learn skills related to being a research scientist, and participate in identifying and answering research questions that can advance science. There may be opportunities for engaging in data collection with families, but it is uncertain if this will align with the timing of this year's DIA JumpStart program.

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**Preferred Majors: Health Sciences, Biomedical Engineering, Psychology, Education**



# Clinical Pharmacy

- **Developing a Novel Combinational Therapeutic Approach to Treat Alcohol Use Disorder and Alcohol Induced Liver Injury**
- **Big Data Analysis Techniques (BDAT) for Scientific Reproducibility**

# Developing a Novel Combinational Therapeutic Approach to Treat Alcohol Use Disorder and Alcohol Induced Liver Injury

**Daryl Davies, Professor Clinical Pharmacy & Associate Dean for Undergraduate Education, USC School of Pharmacy**



- Alcohol use disorder (AUD) ranks third on the list of preventable causes of morbidity and mortality in the United States, having a major national impact affecting over 18 million people and causing over 100,000 deaths annually. Approximately 25% of those individuals suffering AUD develop Alcohol Liver Disease (ALD). Unfortunately, high rates of alcohol (ethanol/EtOH) abuse, including binge-drinking, is increasing, and these unhealthy drinking patterns are contributing to higher incidents of ALD, including an increase in the number of young adults diagnosed with ALD. Current FDA-approved AUD medications are minimally effective in reducing AUD and there are no approved therapies for ameliorating ALD beyond the administration of corticosteroids as anti-inflammatory agents or in worse case scenarios, a liver transplant. The lack of therapies for ALD is due, in part to the multifactorial systemic responses that are associated with heavy EtOH intake and the way EtOH affects individuals. Overall, the lack of effective therapeutics illustrates the necessity for innovative methods and/or the identification of novel targets for the development of useful medications for the treatment of AUD and/or the consequential damage associated with alcohol abuse (e.g., ALD).
- The Davies laboratory has been investigating ivermectin (IVM) and other members of the avermectin family as a new class of pharmacotherapeutics to prevent and/or treat AUD. IVM is already approved for human use therefore, repurposing of IVM for AUD represents a fast and effective translational strategy. Moreover, the lab's extensive preclinical discoveries showing that IVM can reduce EtOH intake in mice sets the stage for a repurposing strategy. Unfortunately, IVM's lipophilic profile and substrate binding to the P-glycoprotein (Pgp/ABCB1) efflux transporter affects its pharmacokinetic (PK) profile, limiting its CNS bioavailability.
- Recently, preliminary investigations suggest that dihydromyricetin (DHM), a flavonoid derived from *Hovenia dulcis*, can be used to significantly improve IVM's ability to reduce EtOH intake in rodents which may be via reduction of Pgp activity. In that DHM has been recently demonstrated to have liver-protective properties, the pairing of IVM/DHM sets the stage for a conceptually novel combinational therapy that can be used to reduce the severity of AUD symptoms, meanwhile, providing benefits to prevent ALD for the patient.
- This project has the opportunity to attract one or multiple undergraduate students that will work alongside Dr. Davies and a PhD student in his lab whereas the student will be able to identify a facet of the ongoing research that meets their interest (e.g., animal behavior, in vitro testing, regulatory hurdles, etc). The project will utilize animal models, behavioral and biochemical pharmacology, and liquid chromatography-mass spectrometry (LC-MS) to demonstrate the utility of the combinational therapy with improved CNS bioavailability and PK properties that include, improved onset of activity and greater tissue retention while monitoring for signs of organ toxicities. Collectively, the project will provide strong evidence behaviorally and mechanistically, that will set the stage for advancing IVM + DHM to the clinic. Importantly, the research experience will provide a fertile research environment that will result in significant growth in pharmacology/drug discovery methods utilizing a multitude of experimental tools in the quest to reduce the consequences of excess EtOH use.

[MORE](#)

**Preferred Majors: Pharmacology, Biochemistry, Chemistry, Biology**



# Big Data Analysis Techniques (BDAT) for Scientific Reproducibility

## Serghei Mangul, Assistant Professor Clinical Pharmacy, USC School of Pharmacy

- The Mangul Lab designs, develops, and applies novel data-driven, computational approaches that accelerate the diffusion of genomics and biomedical data into translational research and education. The undergraduate and graduate students, postdocs, and PI at the Mangul Lab create novel bioinformatics methods and apply these tools to big data, perform benchmarking studies to assess genomics methods and help researchers select the right tools for a project, and work to increase the installation ability and archival stability of bioinformatics software.
- We aim to provide Fellows a realistic experience, at the level of a typical first-year graduate student, in collaborative scientific research and scholarly communication. We will provide hands-on training to help Fellows gain competency in using computational tools for big data analytic techniques (BDAT) and scientific replicability. With our guidance, the Fellow will leverage acquired skill sets to conduct a benchmarking project that assesses the accuracy and usability of computational tools developed for genomics and biomedical data.
- Our proposed activities for the fellows support recent demand for integration of computational skills and scientific reproducibility in biomedical curricula and inquiry-based learning in research universities (Boyer Commission Report). During the last 15 years, the amount of available high throughput (“big”) data has doubled every few months; this exponential growth has made computational tools a key driver of life science research. In order to analyze today’s big data, biomedical researchers now rely on analytical and data visualization computational tools produced by bioinformatics scholars—tools that often lack a graphical user interface. As data sets and analysis techniques become larger and more complex, reproducibility becomes a larger issue: published results often contain analyses that cannot be replicated. Ideally, an undergraduate student would be exposed to computational tools for BDAT and scientific reproducibility while they contemplate career and graduate school options.
- We propose a research project that is well-suited to model for the Fellow how scientific methods, data, and ideas translate in real time. The benchmarking study will require the Fellow to select performance metrics relevant to their research questions; document their work as they install, run, and debug each computational tool; generate summary statistics using open-source tools for BDAT; interpret results in the context of major scientific questions; and present project materials on an open-source data sharing platform. The fellow will perform the benchmarking of Structural Variant (SV) callers, computational tools designed to detect SVs in genomic data. SV are genomic regions that have an altered DNA sequence due to deletion, duplication, insertion, or inversion, and some SVs may indicate disease status.

**Preferred Majors: Computer Science, Life Science (Biology)**

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# Physics & Biological Sciences

- **Pattern Formation of Wild Bacteria**



## Pattern Formation of Wild Bacteria

### James Boedicker, Associate Professor Physics and Astronomy & Biological Sciences

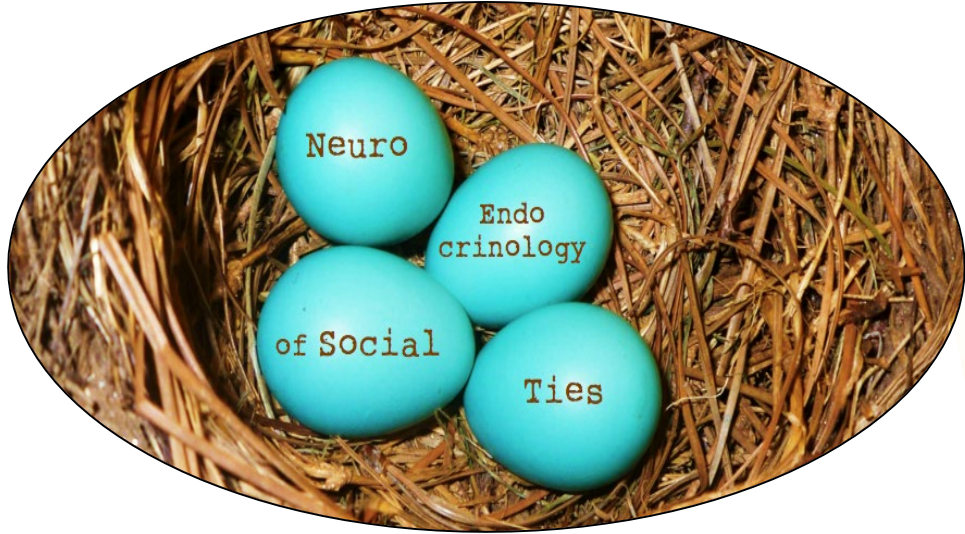
- Although bacteria are small, they have the ability to work together and coordinate activities that can be observed without using a microscope. One such example of cooperation is the formation of elaborate spatial patterns of cells on agar plates. As the billions of cells on the plate eat food, release biochemicals, and swim around, their interactions lead to formation of cellular patterns such as dots and stripes.
- This project will explore and compare the patterns formed by many species of bacteria, in hopes to better understand how interactions between bacteria at the microscopic level orchestrate the formation of these patterns.
- Students involved in this project will learn about microbes and biophysics as well as how to plan, conduct, and interpret scientific experiments. The students will also get experience working in a research lab and using basic techniques such as microscopy, PCR, and cell culture.

**Preferred Majors: Biology, Physics, Chemistry,  
Bioengineering, Chemical Engineering, Mathematics**



# Psychology

- **NeuroEndocrinology of Social Ties (NEST) Lab**



**Preferred Majors: Neuroscience, Psychology, Biology, Sociology, and Anthropology but would consider anyone who is interested in this area of research**

## **NeuroEndocrinology of Social Ties (NEST) Lab Darby Saxbe, Associate Professor Psychology**

- We study the transition to parenthood and its impact on parents' relationships, brains, and hormones. We have a special interest in understanding the fathering brain. We recruit couples who are expecting their first child and follow them across the first year postpartum, with two laboratory visits (a prenatal visit and a postpartum visit) that include discussion tasks, hormone sampling, and questionnaires,, plus neuroimaging scans of the new father.
- Learning Outcomes: Training in health psychology, close relationships, and perinatal processes



# Sociology

- **Comparing the Effects of Voter ID Laws on Immigrant Rights Organizations' Strategies Across State Contexts**



**Voter ID Laws**  
**Voter ID Laws**  
**Voter ID Laws**

## **Comparing the Effects of Voter ID Laws on Immigrant Rights Organizations' Strategies Across State Contexts**

**Hajar Yazdiha, Assistant Professor**  
**Sociology**

- In recent years there has been growing political discourse about the threat of voter fraud, which has driven efforts to implement voter ID requirements across a number of states. Much research tests the effects of these voter ID laws on voter turnout, showing that effects are particularly pronounced for racial and ethnic minorities and immigrants. Beyond direct effects on voter turnout, studies show that racialized policies like these have spillover effects on political culture and the ways that groups organize and do political work. Immigrant rights organizations are one such group, serving as crucial mediators between individuals and the political system. Yet less is known about how Voter ID laws reshape immigrant rights organizing.
- To address this gap, we examine: 1) How do Voter ID laws impact immigrant rights organizations' strategies? 2) How do these effects compare across different state contexts? To answer this question, we use a comparative, longitudinal research design to examine whether and how adopting state-level Voter ID laws shapes organizational strategies. We analyze strategies for immigrant rights organizations across four state contexts, operationalized across a number of political and cultural measures.
- From a unique database of immigrant-serving organizations, we built a qualitative dataset of organizational materials (e.g. press releases, reports, posters, web pages) before and after the enactment of the Voter ID law. Using ATLAS.ti cloud, we will code the organizational documents and the newspaper articles to determine whether strategies shifted and how and then how these effects compare across states. As the COVID-19 pandemic affects immigrant rights mobilization, we will continue collecting data in real time, and we hope this research will give us a better sense of the larger spillover effects of voter ID laws as they reshape political contexts and the most effective strategies for contending with them and increasing immigrant political engagement.

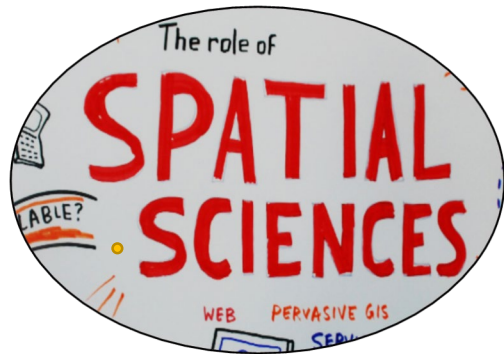
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• **Preferred Majors: Sociology, Ethnic Studies, Political Science**



# Spatial Sciences

- **Evaluation of the Global Commission on HIV and the Law: From Evidence to Action**
- **Neighborhoods and Adolescent Development: Interdisciplinary Approaches Incorporating Virtual Reality**



# Evaluation of the Global Commission on HIV and the Law: From Evidence to Action

## Laura Ferguson, Assistant Professor Preventive Medicine and Spatial Sciences

- With support from the United Nations Development Programme (UNDP), Dr. Ferguson is leading an evaluation of the impact of the Global Commission on HIV and the Law. The law can be a blunt instrument in the HIV response, sometimes with negative unintended impacts, particularly on vulnerable and marginalized populations. Understanding where law is an appropriate tool, where it serves only to exacerbate disease burden and inequalities and how to promote a supportive legal framework is a critical part of the HIV response. This is a dynamic field evolving as HIV science improves and as laws are challenged and updated to reflect emerging issues.
- Having carried out an extensive desk review and a series of key informant interviews, we are currently finalizing the evaluation report. UNDP is committed to ensuring that the report is a useful document that is actually used to inform action moving forward. We are therefore beginning the 'forward-looking' phase of the work where we are identifying critical success factors of the Global Commission's work and creating products and communication materials to reach a diverse audience including Parliamentarians, government ministries, United Nations agencies and civil society organisations. We will use these to influence discussions at the United Nations High Level Meeting on ending HIV and AIDS, to inform short issue briefs, to frame UNDP-convened multi-stakeholder discussions and to inform conference and webinar presentations.
- This program will run concurrently with the SSCI 601a research practicum scheduled for Summer 2021 in USC's interdisciplinary Population, Health, and Place (PHP) Ph.D. program. For the first 7-weeks of the summer session, the students will attend the seminar with Dr. Vos and 2 PHP Ph.D. students. At the same time, the students will work with Dr. Ferguson and her team to train and start on the research project. Through these activities, students will be introduced to the PHP program and serve as undergraduate research assistants on the project.
- DIA Jump start students would be expected to attend seminar discussions and team meetings, read articles, and assist with various tasks assigned by Dr. Ferguson. These tasks would depend on each student's skill level and how rapidly they can be trained.

[MORE](#)

**Preferred Majors: International Relations, Public Health, Law**

# Neighborhoods and Adolescent Development: Interdisciplinary Approaches Incorporating Virtual Reality

**Robert Vos, Assistant Professor (Teaching) Spatial Sciences & Director of Graduate Studies**

**Daniel Hackman, Assistant Professor USC Suzanne Dworak-Peck School of Social Work**

- Neighborhood disadvantage is associated with disparities in physical and mental health in adolescence. Nevertheless, much remains to be understood about how these disparities emerge. One of the hypotheses is that neighborhood environment can be stressful, and that this contributes to inequities in health outcomes. Studying neighborhood influences on stress and emotion is methodologically challenging, and thus Dr. Hackman and his team have developed a novel, virtual reality (VR) experimental model of neighborhood disadvantage and affluence, that can be flexibly used to study stress and neighborhood influences more broadly. We are conducting an NICHD funded study, which we call the THRIVE (THE Research In Virtual Environments) study, to examine the relation between neighborhood environments and stress and emotion in adolescents. We recruit adolescents and their caregivers to complete online questionnaires, and for adolescents to complete a study session where they navigate a VR environment and we measure their emotions, hormones in saliva, and psychophysiological responses. Our team has other projects focused on neighborhoods and child/adolescent development that may also be of interest for fellows.



This program will run concurrently with the SSCI 601a research practicum scheduled for Summer 2021 in USC's interdisciplinary Population, Health, and Place (PHP) Ph.D. program. For the first 7-weeks of the summer session, the students will attend the seminar with Dr. Vos and 2 PHP Ph.D. students. At the same time, the students will work with Dr. Hackman and his team to train and start on the research project. Through these activities, students will be introduced to the PHP program and serve as undergraduate research assistants on the project.

**Preferred Majors: Psychology, Social Work, Sociology (Demography), Geography/Spatial Sciences, and Health Promotion (Public Health)**

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# Stem Cell Biology & Regenerative Medicine

- **Why Can't Mice Regenerate Tails Like Lizards?**
- **Investigating Blood Regeneration at the Single Cell Level**



# Why Can't Mice Regenerate Tails Like Lizards?

## Thomas Lozito, Assistant Professor Orthopaedic Surgery and Stem Cell Biology & Regenerative Medicine

- From lizard species capable of spontaneously regrowing amputated tails to mammals that favor scarring over new tissue growth, amniotes include a diverse range of regenerative potentials. Dr. Lozito's lab seeks to determine the cellular and molecular determinants of this diversity in tail amputation regenerative capacities with the goal of improving an organism's natural wound healing abilities. Our five-year-goal is to create a mouse capable of regrowing an amputated tail like a lizard. We have established research colonies of specialized lizard species exhibiting a gradient of regenerative capabilities, as well as tools for manipulating these capabilities in vivo. Some of these lizard species complete the full tail regrowth program, while other species fail to reach specific milestones along the process.
- The vision for our research program involves using these select lizard species as "stepping stones" for bridging the gap in wound healing capabilities between non-regenerative mice and fully regenerative lizards. If we can sequentially manipulate the mouse to match the healing processes achieved by the next most similar lizard species along the gradient, the anticipated result will be a mouse line with full regenerative capabilities. For example, one of the earliest milestones in tail regeneration involves activation of specific populations of spinal cord neural stem cells (NSCs). NSC activity varies greatly among amniotes, and regenerative species exhibit a cell state not achieved by non-regenerative species.
- During another milestone, regenerative lizard species reprogram their own connective tissue stem cells known as blastema cells capable of differentiating into new tail tissues. Non-regenerative species do not achieve sufficient reprogramming depth, resulting in poor-quality cells with hindered differentiation capacities that favor scar formation. Thus, we hypothesize that differences in NSC and blastema cell signaling account for divergent regenerative abilities among species, and "correcting" these differences will enhance tail regrowth in non-regenerative organisms.
- The overall goals of this research are to identify the specific signaling activities responsible for inducing tissue regeneration, and influence these regenerative signals to improve amputation healing in naturally non-regenerative organisms. Toward these goals, we have created and validated mouse models for the direct translation of lizard-inspired regenerative processes to mammals. In this way, the effects of genocopying and, ultimately, phenocopying the lizard tail regenerative process in mammals will be tested

**Preferred Majors: Biology, Engineering, Computer Science**  
Students only need an interest in biology or bio computing. The more coursework in biology and computer programming the better, since this will allow them to get more out of the research



# Investigating Blood Regeneration at the Single Cell Level

## Rong Lu, Richard N. Merkin Assistant Professor Stem Cell Biology & Regenerative Medicine, Biomedical Engineering, Medicine, and Gerontology

- Stem cells replenish tissues and organs over an organism's lifetime and can repair damage after injury. With their special capacities for self-renewal and differentiation, stem cells promise to revolutionize medicine. To develop better and safer stem cell therapies, it is critically important to improve the understanding of stem cell regulation.
- Most of the knowledge about stem cell regulation comes from studies that investigate the aggregate behaviors of thousands to millions of stem cells. However, recent studies suggest that individual hematopoietic stem cells (HSCs) behave substantially differently from one another in both mice and humans. These newly discovered inter-cellular differences present exciting new opportunities for studying HSC regulation. However, they also present significant technical challenges that are difficult to address with conventional approaches.
- Our lab uses a novel systems biology approach combined with quantitative single-cell analysis to determine the cellular and molecular mechanisms underlying HSC heterogeneity and coordination, as well as their influences on aging and the pathogenesis of hematopoietic diseases. With these technical advances, our research will also produce new fundamental knowledge about blood regeneration, the foundation of bone marrow transplantation.
- The summer research project will focus on understanding the blood regenerative characteristics of HSCs at the single cell level. The student(s) will work with other senior researchers in the lab to analyze HSC behaviors in mice. Together, we will develop new data analyses pipelines to analyze high throughput sequencing data, imaging data, and single cell RNA seq data. We will identify individual HSCs with distinct blood production amount and biases. And we will explore the molecular regulators underlying these heterogeneous behaviors.

[MORE](#)

**Preferred Majors: Computational Biology, Statistics, Math, Engineering, Computer Science**



# Research Opportunities

## Additional Information

**Faculty Host: Stacey Dusing**

### **Pediatric Physical Therapy Research Experience**

Students gain valuable skills in interacting with parents and children engaged in research, observing intervention and assessment methods, managing video data, and in some cases completing basic methodological assessments with one to one supervision. Students may also have an opportunity to learn how to do behavioral coding, video editing, basic programming, data management or entry. Each student will attend a bi-weekly seminar/lab meeting of developmental researchers and present a poster or presentation on their role in the research at the end of the session

Participants in this research experience will attain 3 learning objectives:

- 1) Learn the ethical and safety considerations needed to participate in research and demonstrate the ability to integrate these values during interactions with participants and their families.
- 2) Gain an understanding of the multiple steps and roles of different researchers involved in a clinical trial.
- 3) Develop their skills in reading and discussing literature related to the research.

In addition to these general learning objectives each student will complete an Individualized Development Plan to help self reflect on their knowledge, preferences, strengths and areas for growth. Based on this assessment a plan will be established to increase opportunities in specific areas as is safe and ethical.

It is preferred that applicants have a car and be able to drive in Los Angeles as some research is community based and they may need to meet the researcher at the site. Depending on COVID conditions, the student may have periods of time they are in the research lab on their own completing tasks they are trained to complete. As such, students need to be independent and motivated to learn.

# Research Opportunities

## Additional Information

**Faculty Host: Kate Havens**  
**Perinatal Health Biomechanics Research**

Examples of projects include:

Contribute to a systematic review of literature on the topics of pelvic girdle pain, low back pain, and current physical therapy interventions in the postpartum population

Collect biomechanical motion capture data on postpartum mother and her infant in the Jacquelin Perry Musculoskeletal Biomechanics Research Laboratory

Create a data processing pipeline to analyze previously collected pilot kinematic and electromyographic data in innovative and streamlined ways

Design motion characterization methods for analyzing publically available videos of mothers interacting with their infants

Establish scientific writing skills by contributing to written work on a project

The Jumpstart scholar will work closely with a faculty mentor and will be expected to report weekly on the progress of the project during lab meetings. Scholars will function as part of the Perinatal Health Research team and will learn the responsibility of themselves and colleagues, ethical standards in laboratory research, problem solving, and laboratory procedures. They may have the opportunity to present their research at internal, regional, or national conferences. (cont)

# Research Opportunities

## Additional Information

**Faculty Host: Kate Havens**

**Perinatal Health Biomechanics Research**

Learning Outcomes (cont):

- Critically analyze research evidence, including determining risk of bias, understanding basic principles of common statistical methods used in relevant literature, and interpreting key findings.
- Contribute to all aspects of human motion data collection: setting up motion markers and electromyographic and acceleration sensors, calibrating cameras, placing equipment on participants, running software programs and timers during collection, assuring data quality, and completing equipment protocols.
- Understand current data analysis processing techniques and software, including learning Qualisys motion tracking and/or Visual 3D. Creatively conceptualize ways to streamline these processes using data reduction, coding, or other techniques.
- Identify sources of publicly available videos and keyword search procedures to identify usable videos for mother-infant physical activities, and identify analysis methods or software to quantitatively describe movements.
- Disseminate findings of their project by writing and presenting updates at lab meetings, and contributing to abstracts or manuscripts to present their findings at regional or national conferences.

# Research Opportunities

## Additional Information

**Faculty Host: Kristan Leech**  
**Effects of Gait Biofeedback on Walking Pattern Post-Stroke**

Learning Outcomes:

At the end of this opportunity, the student will:

- Demonstrate proficiency in the fundamentals of coding in MATLAB
- Gain experience with clinical research (human subjects data collection – specifically, motion capture data acquisition; COVID-related restrictions allowing).
- Become independent with motion capture data processing and analysis
- Develop a deeper understanding of the research process and the experience of completing a PhD
- Gain experience in scientific communication through the creation and presentation of a research poster summarizing their work.

# Research Opportunities

## Additional Information

**Faculty Host: Jason Kutch**

**Neuro-Informatics and Neuro-Therapeutics for Chronic Pain**

### **Additional Information**

There is a pressing need to increase diversity in clinical scientists studying the neuroscience pain. Scientists of color are not well-represented in this field. Pain is known to be a major determinant for quality-of-life. Many researchers, including myself, have shown that people of color are not sufficiently represented in clinical research studies of pain. This is coupled with the known systemic racism experienced by people of color when reporting pain to their health care providers. The best way to address these problems is to have more scientists of color trained in the study of pain so that diversity in the pool of scientists can improve the diversity in research study participants and ultimately improve patient care for everyone.

# Research Opportunities

## Additional Information

**Faculty Host: George Salem**

**Examining the Role of Diet on Responses to Acute High-Intensity Interval Training**

### **Objectives:**

OBJECTIVE 1: Quantify and compare the acute effects on inflammatory and tissue damage biomarker levels in response to a HIIT running protocol vs HIIT cycling protocol in healthy, recreationally active, young adults.

OBJECTIVE 2: Quantify and compare the influence of *diet* on the levels of circulating inflammatory and tissue damage markers following HIIT exercise in healthy, recreationally active, young adults.

OBJECTIVE 3: Quantify the biomechanical demand (impact forces/peak load/rate of force [ROF] development) in a HIIT cycling exercise bout compared to a running exercise bout.

### **Learning Outcomes:**

The Jumpstart scholar will be introduced to the following educational/research experiences:

1. Exposure to the IRB process
2. Assist with participant recruitment
3. Learn biomechanical principals and use motion capture equipment including:
  - Qualysis Motion Capture System
  - Moticon force-measurement insoles - impact forces
  - AMTI force plate

(cont)

# Research Opportunities

## Additional Information

**Faculty Host: George Salem**

**Learning Outcomes (cont):**

4. Learn body composition measurement techniques
  - Bioelectric impedance analysis
5. Learn exercise physiological measurement techniques
  - Heart Rate Maximum (HRmax) testing
  - Measuring delayed onset muscle soreness using visual analog scale
6. Understand the rationale and development of HIIT protocols using HRmax data
  - Cycling and Running
7. Blood collection processes
8. Blood processing/fractionation
9. Understand the importance of metabolic/inflammatory markers
10. Understand and use diet and food recalls
11. Data processing with:
  - Move 3D
  - Matlab
12. Statistical analyses
  - SPSS
13. Data interpretation
14. Abstract writing/submission

# Research Opportunities

## Additional Information

**Faculty Host: Natalia Sanchez**

**Recovery and Compensation During Walking in People Post-Stroke**

### **Learning Outcomes:**

- Readily perform systematic literature reviews
- Understand the neuroscience underlying the control of human movement
- Understand the changes neural control associated with nervous system injury such as stroke
- Implement data collection protocols for gait analysis.
- Identify and fix common faults observed in signal acquisition systems
- Use Matlab to process, graph, and quantify parameters extracted from movement-related signals
- Draft materials for scientific dissemination including posters, presentations and manuscripts



## Research Opportunities Additional Information

**Faculty Host: Carolee Winstein**

**Effectiveness of an Online Mindfulness Intervention for Stroke Survivors and Their Caregivers**

### **Learning Outcomes:**

The Motor Behavior and Neurorehabilitation Laboratory oversees an interdisciplinary research program focused on understanding control, rehabilitation and recovery of goal-directed movements that emerge from a dynamic brain-behavior system in brain-damaged conditions.

The student will gain a greater understanding of how research methods can be used to answer clinically-relevant questions. The student will also familiarize themselves with the different steps involved in conducting a clinical trial in rehabilitation medicine. They will be involved in the recruitment of participants, the data collection and analysis, and the presentation of findings for scientific communication and dissemination. The student will gain more exposure to other projects ongoing in the laboratory, interact with other lab members and become an integrated member of our research team.

(cont)

# Research Opportunities

## Additional Information

**Faculty Host Carolee Winstein**

**Effectiveness of an online mindfulness intervention for stroke survivors and their caregivers**

### **Learning Outcomes (cont):**

By the end of the program, we anticipate that the student will demonstrate improved proficiency in the following research knowledge and skills:

- Learn and understand the methods involved in rehabilitation research.
- Learn about the protection of human subject's in research and the role of the Institutional Review Board
- Develop the skills to read and interpret simple research papers.
- Develop the verbal, non-verbal and written communication skills needed to effectively communicate with stroke survivors.
- Gain exposure to scientific writing and results dissemination.
- Take responsibilities in coordinating portions of a clinical trial.
- Understand the methods to analyze quantitative and qualitative data.

Hours: 9:00 am to 5:00 pm. The student is expected to show flexibility in their work times, as data collection may extend after 5pm. In those cases, start time can be adjusted, accordingly.

We encourage students who are interested in health care and neuroscience to apply.

# Research Opportunities

## Additional Information

**Faculty Host Carly Kenkel**

**Investigating the Role of Bacteria in the Maintenance of cnidarian-algal symbioses**

### **Learning Outcomes:**

Students will understand the biology and ecology of corals, students will be able to demonstrate proficiency in use of multiple software programs (MeshLab, R), students will be able to apply basic statistical tests to analyse coral growth and morphology.

### **Additional information:**

We request that students plan on participating in lab meetings (both journal club and regular works discussions) in addition to their project specific activities. Also note that specific project objectives and learning outcomes may need to be modified depending on the status of the pandemic.

The Kenkel Lab can support one student from the JumpStart program, and projects will be assigned based on participant interest.

# Research Opportunities

## Additional Information

**Faculty Host: Matt Dean**

**Do ITIH Proteins Influence Fertilization Success?**

### **Learning Outcomes:**

In the course of the proposed experiments, students will learn mouse husbandry, experimental design, and various protein manipulation techniques. Students will learn to stain ITIH proteins with antibodies and develop an assay to monitor the rate at which ITIH proteins break down upon exposure to sperm from genetically distinct strains of mice. In addition, students will participate in weekly discussions of recent literature and become versed in concepts of evolutionary biology and sexual selection. Data collected during this project will be part of a larger grant proposal to be submitted, so students will also learn the skills of summarizing data with scientific writing.

# Research Opportunities

## Additional Information

**Faculty Host: Lindsey Schier**

**Role of Glucokinase in the Taste Cells in Sugar Appetite**

### **Learning Objectives:**

- Experimental design
- Experimental planning
- Rodent handling and care
- Rodent microsurgery
- Solution Preparation
- Rodent behavioral testing
- Epithelial tissue harvest
- Quantitative PCR
- Data entry and statistical analyses
- Graphing/Figure preparation
- Scientific reading/writing/presentation

## Research Opportunities Additional Information

**Faculty Host: Yang Chai**

**Research in Craniofacial Birth Defects and Tissue Regeneration**

### **Learning Outcomes:**

The Center for Craniofacial Molecular Biology is a cutting-edge research center with a full suite of state-of-the-art equipment shared by all of our affiliated researchers. It provides a rich academic environment with weekly seminars, monthly journal club, and numerous venues through which to learn from each other and our colleagues at research institutions across the globe. Our JumpStart Scholar will hone their skills in important molecular and cellular biology techniques that will provide a strong foundation for future graduate studies or laboratory-based positions. Additionally, the JumpStart Scholar will gain confidence in visualization and communication of scientific concepts in a variety of settings, working directly with experienced postdoctoral fellows and highly trained professional laboratory staff. To culminate the summer, our JumpStart Scholar will give a presentation of their research to colleagues and faculty at the Center for Craniofacial Molecular Biology.

(cont)

# Research Opportunities

## Additional Information

**Faculty Host: Yang Chai**

**Research in Craniofacial Birth Defects and Tissue Regeneration**

### **Learning Outcomes (cont):**

The JumpStart scholar will work at the [Center for Craniofacial Biology](#) (CCMB), a research laboratory located on the Health Sciences Campus. CCMB is a part of the [Ostrow School of Dentistry of USC](#).

The laboratory is funded through numerous federal and organization sponsored research grants.

Many of these grants are from the National Institute of Dental and Craniofacial Research, under which basic research is conducted into developmental, biochemical and molecular biological aspects of human development with a special emphasis on craniofacial structures in both health and disease.

CCMB has 10 full-time and 1 part-time investigators working with graduate students, postdoctoral fellows, and research technicians and administrators. The Center represents a diverse group of men and women from all points of the globe.

This group has established an outstanding record of research accomplishments, making significant new discoveries in areas such as: Molecular genetics of tooth development, Genetics, prevention, and treatment of cleft lip and palate, Dental enamel matrix formation and biomineralization, Transcriptional control of craniofacial development, Stem cell-mediated craniofacial tissue regeneration. Head and neck cancer, Neurodevelopmental and neurodegenerative disorders and Cardiovascular development.

# Research Opportunities

## Additional Information

**Faculty Host: Janet Moradian-Oldak**

**Rebuilding Lost Tooth Enamel Through Development of a Hydrogel**

### Learning Outcomes:

- Students will collaborate with graduate students and postdoctoral fellows in the lab to complete a research poster, and present their findings to colleagues and faculty at the end of the summer.
- An understanding of the general biologic principles that apply to the formation of tooth enamel and fabrication of enamel like materials.
- Experience with the inner workings of NIH grant R01 level study in a research setting.
- Clarity on the process and information regarding potential next steps in higher education, and success within graduate programs.
- Learning laboratory techniques and the principals behind them

Dr. Oldak holds a joint appointment in Biomedical Sciences/Bioengineering at the Viterbi School of Engineering, and the Ostrow School of Dentistry, Biological Sciences division.

For additional information please visit her website: <https://dent-web10.usc.edu/ccmb/faculty>

<https://scholar.google.com/citations?user=syNyc9wAAAAJ&hl=en>

<http://oldaklab.usc.edu/>



## Research Opportunities Additional Information

**Faculty Host: William Deverell**  
**The Chinatown History Project**

### **Learning Outcomes:**

Student researchers will join a broad and diverse research team made up of more than a dozen participants. We cannot visit the neighborhood as it was but its history is buried in archives, public documents, journalistic sources, other photographic images, and within human memories. The Chinatown History Project proceeds on two major inquiries of humanities research, analysis and outreach. A team of historians, archivists, curators, and student researchers is at work adding data to the historic images and sites which they depict. *Who lived in this apartment building before it was knocked down? Who worked at this stable? Who owned or was employed by this grocery store, that auto body shop, this herbalist?* Using conventional historical sources – census and immigration records, scholarly monographs and articles, extant oral histories, newspaper sources, legal records, even the demolition permits – we are building a searchable database rich with social history variables (name, race/ethnicity/date and place of birth, occupation; business type, etc.).

(cont)

## Research Opportunities Additional Information

**Faculty Host: William Deverell**  
**The Chinatown History Project**

### Learning Outcomes (cont)

Students will immerse themselves into the lost neighborhood and its history – analyzing and inputting social historical variables (name, occupation, citizenship status, family information, residence, etc.) and visual sources into the original database. Students will learn digital humanities tools, techniques, and the ways in which historical data and interpretations can then be brought to wider public dissemination and dialogue. Student researchers will be part of the team’s commitment to memorializing the lost Chinatown of Los Angeles, a facet of the project that will bring us all into conversation with civic leaders, members of the Los Angeles Mayor’s Civic Memory Working Group, our partners at the Chinese Historical Society of Southern California, and Los Angeles Metro (the owner of Union Station), with whom we expect to work closely in installing new commemorative features atop where Chinatown once stood.

Should pandemic circumstances allow, we expect that this research will include the opportunity to familiarize one’s self with the actual spaces and places of Los Angeles Chinatown. The combination of fieldwork exercises and data entry/database creation will, we think, ensure a particularly memorable and enjoyable research experience.

## Research Opportunities Additional Information

**Faculty Host: Ite Offringa**

**Development of a Powerful New Organoid Model to Study Lung Adenocarcinoma**

The summer student working on the project will learn to culture the cells in 2 and 3 dimensions and may use molecular cloning to engineer new constructs to introduce into the cells, and/or characterize existing cell lines we have developed. The student may use a variety of techniques including fluorescence microscopy, migration and metastasis assays, PCR, CRISPR/Cas9 (genome engineering) and transcriptional profiling.

### **Learning Outcomes:**

Understand what lung cancer is. Understand the concepts of cancer driver genes, cellular transformation and the properties of transformed cells. Understand how drug resistance might develop. Lab skills: Be able to culture cells in vitro and be able to apply a variety of molecular biology techniques to engineer and/or molecularly characterize the cells.

# Research Opportunities

## Additional Information

**Faculty Host: Amber Angell**

**How Do Girls Come to Get an Autism Diagnosis?**

### **Learning Outcomes:**

Students will:

- Become familiar with the autism disparities literature
- Co-conduct (along with a graduate student) an interview with the parents of a girl with autism
- Assist a graduate student in the lab with data management, cleaning, and analysis
- Support manuscript and/or grant writing
- Participate in lab meetings

# Research Opportunities

## Additional Information

**Faculty Host: Lisa Aziz –Zadeh**  
**The A-Z Lab at the Brain and Creativity Institute**

### **Student Schedule:**

- Evenings and weekend availability *required* for study population
- Lab members are present 10am-7pm on week days (so flexible hours within that time are possible)
- Some remote work possible during the week

# Research Opportunities

## Additional Information

**Faculty Host: Roberta Pineda**  
**Neonatal Intensive Care Unit Therapy Research Laboratory**

### Learning Outcomes:

- 1) Demonstrate skills related to doing a literature review of current evidence on a topic related to the NICU, early human development or high-risk families.
- 2) Understand how to operationalize variables for research
- 3) Identify a research question that can be answered from longitudinal data collected on high-risk infants and their families
- 4) Learn about medical factors related to NICU care; learn about parenting a high risk infant in the NICU; learn about the early sensory environment in the NICU and how it can impact brain development; learn about therapeutic strategies used to improve outcomes of high-risk infants and families
- 5) Learn research skills: conducting literature reviews, operationalizing, data collection and management, using SPSS and analyzing data, conducting professional presentations, reporting research results; ethics and conduct in research
- 6) Explore interests related to obtaining a PhD and becoming a research scientist

This experience will provide rich learning opportunities and the ability to engage in research. Due to the pandemic, it is uncertain what in-person opportunities will be available. However, due to the structure of the NICU Therapy Lab and its productivity over the past year, there will be much to engage in despite it being in-person or virtual.

# Research Opportunities

## Additional Information

**Faculty Host: Daryl Davies**

**Developing a Novel Combinational Therapeutic Approach to Treat Alcohol Use Disorder and Alcohol Induced Liver Injury**

### **Learning Outcomes:**

**Objective 1: Technical skill development.** Student will be provided research training and technical skill development in alcohol research to accomplish their scientific goals. Students will design, develop, and apply methodology to the AUD-related research project as described above. The project is well developed, as such we are confident that the student will have a productive research experience while at USC.

**Measurable Outcome 01:** Student will become knowledgeable regarding substance use and addiction over the course of the summer research experience.

**Measurable Outcome 02:** Student will develop a general understanding of the research programs ongoing in my laboratory and this will help advance their scientific knowledge curated for their topic of interest including a final presentation of their work.

**Objective 2: Professional development.** Student will receive training and education to develop independent substance use research project under the mentorship of the PI (Davies) and a URM PhD graduate student with a focus on AUD related projects. As a result, the student will be exposed to academic or industry research careers, professional mentorship, and scientific communication opportunities related to AUD research.

**Measurable Outcome 03:** Student will be guided in exploring a range of substance use and addiction science careers and graduate programs available to PhD-level research scientists; measured by student survey responses that gauge student exposure to careers and completion of graduate school applications.

**Measurable Outcome 04:** Student will participate in scientific inquiry and information dissemination to peers and colleagues; measured by presentations in a public forum and/or co-authorship on publications/abstracts. (cont)

# Research Opportunities

## Additional Information

**Faculty Host: Daryl Davies**

**Developing a Novel Combinational Therapeutic Approach to Treat Alcohol Use Disorder and Alcohol Induced Liver Injury**

Learning Outcomes (cont):

**Objective 3: *Interdisciplinary collaboration.*** Student will participate in interdepartmental and inter-school scientific projects via Dr. Davies interactions with the Institute of Addiction Science at USC. This will help the student to develop their creative approach to questions or problems, in which all program faculty of diverse fields will be available to the student for engagement and project development.

*Measurable Outcome 05:* Student interactions with interdepartmental collaborating research groups will promote creativity and knowledge outside of their research scope; measured by journal club/cross-disciplinary seminar meeting engagement and self-reported student surveys.

*Measurable Outcome 06:* Student will collaborate to develop their unique research project by engaging with departmental and interdepartmental mentors; measured by self-reported surveys from students and mentors.

**Objective 4: *Scientific and community engagement.*** Student engagement with faculty, research groups, and communities within and around Los Angeles will build a sense of belonging and self-identification as a researcher engaged in the public and scientific community.

*Measurable Outcome 07:* Student will participate in community engagement opportunities measured by active participation in community events and self-reported survey responses.

**Objective 5: *Scientific.*** A major goal for the 10 week experience is to develop a solid research opportunity that will result in the student being able to engage in local and national/international scientific conference by presenting a oral/poster presentation and networking with experts in the field; measured by active participation at conferences and self-reported surveys.



# Research Opportunities

## Additional Information

**Faculty Host: Serghei Mangul**

**Big Data Analysis Techniques (BDAT) for Scientific Reproducibility**

### Learning Outcomes:

The objective of this course is to train students in the state of the art computational tools and methods for reproducible, rigorous, and reproducible biomedical data analysis, including methods to visualize display data and perform appropriate statistical analysis. Students are expected to learn how to:

- Understand commonly used bioinformatics terms and definitions
- Analyze the large-scale biomedical data using commonly used interactive python-based libraries and packages
- Use various visualizations techniques to display real-world biomedical data in real-time
- Select the most appropriate statistical methods and apply it to real word biomedical data
- Use version control and public repositories for transparent and reproducible data analysis
- Write the data analysis component of a scientific manuscript and create an easy-to-navigate repository with the analysis accompanying the scientific manuscript
- Understand in brief, the components and steps involved in a typical bioinformatics pipeline and the types of input and output file formats
- Read SAM, BAM, FASTQ and other file formats
- Prepare the “Code availability” and “Data availability” statement to make materials, data, code, and associated protocols promptly available to readers as is required by a large number of scientific journals (e.g. Nature journals)

## Research Opportunities Additional Information

**Faculty Host: Hajar Yazdiha**

**Comparing the Effects of Voter ID Laws on Immigrant Rights Organizations' Strategies Across State Contexts**

### **Learning Outcomes:**

Students will collaborate closely with Dr. Yazdiha and a graduate student advisor as we refine databases, collect, manage, analyze, and report multiple types of data including: organizational records, surveys, newspaper text, and archival data. Additionally, students will learn to collaborate as a research team and will learn new cutting-edge research tools like Atlas.TI cloud.

Dr. Yazdiha intentionally trains students in mixed methods to both engage a variety of learning styles and to build their expertise in a range of modes of social scientific research. As a result, we expect that this research experience will give students an understanding of research design and familiarity with data collection and data analysis. They will be able to articulate research questions, preliminary coding, and tentative conclusions.

## Research Opportunities Additional Information

**Faculty Host: Laura Ferguson**

**Evaluation of the Global Commission on HIV and the Law: From Evidence to Action**

Our hope is that we can use the evaluation findings to stimulate discussions around the current and forecast greatest needs in the area of HIV and the law so as to create both a research agenda and an action plan for advancing this work globally. This research situates us at the cutting edge of the field, positioning us well to lead discussions with relevant stakeholders and chart a way forward.

### **Learning Outcomes:**

The primary learning outcomes will be about how to use research findings to inform real-world action. This will include carrying out desk research (peer-reviewed publications and grey literature, as well as secondary analysis of our evaluation data) to inform additional research outputs. By contributing to these outputs, the student will learn about communicating research findings to different audiences ranging from civil society to high-level politicians through diverse media.

The student will also learn about work at the intersection of HIV and the law. This is a particularly interesting topic at the moment given the ways in which the use of law in responses to the COVID-19 pandemic has had many negative unintended consequences around the world, again exacerbating pre-existing inequalities.

# Research Opportunities

## Additional Information

**Faculty Hosts: Robert Vos and Daniel Hackman**

**Neighborhoods and Adolescent Development: Interdisciplinary Approaches Incorporating Virtual Reality**

DIA Jump start students would be expected to attend seminar discussions and team meetings, read articles alongside the Ph.D. students and team staff, and assist with various data gathering and processing tasks, including working with geographic information systems and assisting with executing the protocol in the lab. These tasks would depend on each student's skill level and how rapidly they can be trained. There is a possibility that the students will work to geocode participants in the study and produce data on their neighborhood contexts.

### **Learning Outcomes:**

At the conclusion of their time with us, the students will be able to:

- Identify research strategies for searching relevant scientific literature
- Improve understanding of neighborhood influences on health and development

(cont)

## Research Opportunities Additional Information

**Faculty Hosts: Robert Vos and Daniel Hackman**

**Neighborhoods and Adolescent Development: Interdisciplinary Approaches Incorporating Virtual Reality**

### **Learning Outcomes (cont):**

- Produce an interdisciplinary annotated bibliography to support research on neighborhoods and child and adolescent development, such as on neuro-biological/physiological and emotional responsiveness to neighborhood environments
- Gain practical experience in assisting in executing a study protocol to collect data with human research subjects in USC labs, including experience with virtual reality and multiple types of psychological and biological measures.
- Map human research subjects to assess the characteristics of their residential neighborhoods

**Program Dates:** Preferred start date is May 19, 2021 to run parallel with start of PHP research practicum course. Preferred end date is August 10, to coordinate with the final activities of the DIA undergraduate program. However, we are flexible with the start date during the recruiting process in case students are not available until somewhat later.

Link for the PHP website: <https://spatial.usc.edu/ph-d-in-population/>

# Research Opportunities

## Additional Information

**Faculty Host: Thomas Lozito**

### **Why Can't Mice Regenerate Tails Like Lizards?**

The successful completion of this research program will answer several long-standing questions central to the field of regeneration and enhance our understanding of differentiation processes involved in adult amniote regeneration. Additionally, completion of the proposed studies will result in important findings pertaining to improving the regenerative capacities of an organism, specifically “treating” a non-regenerating species to allow it to regrow a tail. The principles and experience gained from completing such a milestone can contribute to the knowledge base for improving the healing abilities of non-regenerative organisms, including humans.

### **Learning Outcomes:**

The goals of a summer research experience are to expose students to the world of scientific research while encouraging pursuit of further studies. Over the summer, students will learn the scientific method and put it to practice as they pursue their projects. Specifically, students will learn how to formulate a scientific question and hypothesis, and to design meaningful experiments for testing that hypothesis. Students will learn fundamental lab methods in histology, immunostaining, microscopy, in situ hybridization, and cell culture. Students will also learn how to analyze results, including statistical analyses, and draw conclusions. Finally, students will learn how to effectively present their projects and findings during lab meetings.

# Research Opportunities

## Additional Information

**Faculty Host: Rong Lu**

**Investigating blood regeneration at the single cell level**

### **Learning Outcomes:**

- The summer research project will provide students with the following skills:
- Understanding stem cell biology and the potential of regenerative medicine
- Bioinformatic analyses of primary experimental data
- Work with mouse and human models (in vivo and in vitro)
- Learn about cutting edge technology on single cell and clonal analyses
- Work with others and participate in scientific discussions