

## MSRIP 2018 FACULTY RESEARCH PROJECTS

The following faculty research projects are organized by colleges, and then alphabetically by department. Students are encouraged to look at related fields, as well as within their major departments for research projects, which might be interesting to them. For example, the research project in the theater department might also be interesting to sociology or education majors.

### BOURNS COLLEGE OF ENGINEERING

#### Bioengineering

Faculty Mentor: **Dr. Kevin Freedman**

Research Project: We will use nanotechnology to study the biophysics of protein and DNA which can be useful for both biomedical applications as well as basic science understanding of how a cell works. The goal is to use both electrical and optical methods to study single molecule kinetics which can offer a better view of what is happening at the nanoscale.

Faculty Mentor: **Dr. Xiaoping Hu**

Research Project: Our lab develops magnetic resonance imaging techniques for studying the brain and applies them to understand the brain in normal populations and patients. Possible project could be analyzing data from human studies for several ongoing projects, or carrying out behavioral testing of animal models performing biochemical assays of brain tissue.

Faculty Mentor: **Dr. Huinan Liu**

Research Project: My Biomaterials and Nanomedicine Lab research involves design, fabrication and evaluation of novel biomaterials for tissue regeneration, controlled drug delivery, and medical implant/device applications. Medical applications of nanomaterials and nanotechnology are actively explored through both fundamental studies and applied research. Materials studied in the lab include polymer, ceramic nanoparticles, polymer/ceramic nanocomposites and biodegradable metals. Students will be involved in developing novel materials that stimulates stem cells toward nerve regeneration, or bone/cartilage regeneration. Students will acquire lab skills and gain experience in material synthesis, characterization, electron microscopy, x-ray spectroscopy, optical emission spectrometry, fluorescence microscopy, bacterial culture, and mammalian cell culture studies. Previous outstanding undergraduate student researchers in Liu lab have co-authored scientific publications and/or presented their work at national scientific conferences.

#### Chemical and Environmental Engineering

Faculty Mentor: **Dr. Kandi Abdul-Aziz**

Research Project: Elucidating the Ion Transport Mechanism of Catalytic Metals in Intelligent Perovskite Materials.

Description: A DFT focused study on the role of defects and surface structure to the inherent diffusion mechanism of the catalytic metal.

### Chemical and Environmental Engineering - Continued

Faculty Mentor: **Dr. Robert Jinkerson**

Research Project: 1) Engineering algae for biofuel production; 2) Exploring the role of coral-algal symbiosis in coral bleaching.

### Chemical and Environmental Engineering and Material Science

Faculty Mentor: **Dr. Bryan M. Wong**

Research Project: Our group develops and applies theoretical methods to calculate, understand, and rationally design multi-functional materials – often working closely with experimentalists at each step. Specifically, we use state-of-the-art quantum calculations to predict the properties of electronic materials – either previously synthesized or yet to be made. We believe that several technological applications in energy generation and conversion can be significantly enhanced by a deep understanding of electron dynamics. Examples of techniques and systems studied in our group include time-dependent density functional theory for photovoltaic materials, electron transport in chromophore-functionalized carbon nanosystems, optoelectronic effects in core-shell semiconductor nanowires, and large-scale, first-principles calculations for predicting growth and electronic properties of nanomaterials.

### Computer Science

Faculty Mentor: **Dr. Mohsen Lesani**

Research Project: Functional programming. Program synthesis.

### Electrical and Computer Engineering

Faculty Mentor: **Dr. Salman Asif**

Research Project: Computer vision: tracking, identifying objects in cluttered scene. Machine learning: dimensionality reduction for streaming signals. Compressive sensing: signal recovery from 1-bit or general nonlinear measurements.

## COLLEGE OF HUMANITIES, ARTS AND SOCIAL SCIENCES

### Anthropology

Faculty Mentor: **Dr. Anthony Jerry**

Research Project: Collecting and analyzing narrative from youth, 18-25, on three aspects of citizenship; 1) coming out narratives of self-identified queer youth, 2) narratives of “first generation” citizenship, and 3) first encounters with the “n-word”. Students would be able to help conduct research in these areas, or conduct their own related research.

### History

Faculty Mentor: **Dr. Alejandra Dubcovsky**

Research Project: Topics in Early America, Native American History, History of Slavery, Gender and Women's History

## History - continued

Faculty Mentor: **Dr. Dana Simmons**

Research Project: History of science and medicine, with emphasis on race, gender, life sciences. Historical and ethnographic study of hunger and food insecurity, especially on college campuses. Student would conduct independent research on a topic developed in consultation with faculty mentor(s,) and would receive regular feedback as research progresses.

## Hispanic Studies

Faculty Mentor: **Dr. Covadonga Lamar Prieto**

Research Setting: Lab

Research Project: Spanish language in California, historic and contemporary Digital Humanities.

## Sociology

Faculty Mentor: **Dr. Adalberto Aguirre Jr.**

Research Setting: Lab

Research Project: 1) The college experiences of DACA students in higher education. 2) The effects of detention centers on undocumented persons/families. 3) Diversity issues in higher education.

Faculty Mentor: **Dr. Victoria Reyes**

Research Setting: Lab

Research Project: The Racialized and Gendered Reputation of Subic Bay, Philippines

## Psychology

Faculty Mentor: **Dr. Liz Davis**

Research Project: Physiology and emotion regulation in children.

Faculty Mentor: **Dr. Rachel Wu**

Research Setting: Lab/library, etc. in the CALLA (Cognitive Agility across the Lifespan via Learning and Attention) research lab ([www.callalab.com](http://www.callalab.com)). Projects include: visual search and category learning with children, undergraduates and older adults.

Faculty Mentor: **Dr. Judith Kroll**

Research Project: Being and Becoming Bilingual.

The research in our lab (see <https://bilingualismmindbrain.com/>) examines the way that mind and brain juggle the presence of two languages. We use behavior and measures of brain activity to ask questions about how bilinguals switch between their two languages, how second language learners acquire a new language as an adult, and what cognitive benefits might result as a consequence. The summer experience is an opportunity to work together with faculty, graduate students, postdocs, and undergraduate research students to gain research training.

## Psychology - continued

Faculty Mentor: **Dr. Edward Zagha**

**Research Project:** We study the neural mechanisms underlying sensory detection and impulse control. Through this research we hope to better understand how neocortex enables us to have flexible and meaningful interactions with our surroundings. We investigate this topic at multiple levels of organization- from neurons to neural circuits to behavior.

Project 1: Expression patterns of various types of neurons in sensory and motor cortex (involves histology, tissue staining and fixed-tissue microscopy).

Project 2: Behavioral training of laboratory animals in detection and interval timing tasks (involves designing behavioral tasks, training animals and analyzing behavioral performance).

Faculty Mentor: **Dr. Weiwei Zhang**

**Research Project:** Title: The mental muscle .  
The overall objective of this project is to understand the effects of effortful physical actions on cognition and the neurocognitive mechanisms underlying these effects. This proposal takes the first systematic approach to assess how physical efforts affect one's ability to retain visual information over a short period of time (Objective 1), to inhibit distracting information (Objective 2), and to solve problems (Objective 3). These three core cognitive functions set high demands on cognitive resources from working memory (WM), a capacity-limited system that stores and processes information at the service of other ongoing activities. As a result, these resource-dependent processes, but not resource-independent processes (e.g., attention deployment), are susceptible to the influences of concurrent physical effort that diverts resource away from WM. This proposal further addresses the effortful nature of WM and elucidate whether effort avoidance can account for limited capacity of WM (Objective 4), for which there are mixed effects and substantial controversy. Together these novel effects of physical efforts on core cognitive functions and the underlying neurocognitive mechanisms will establish a theory driven approach to conceptualizing the overall interactions between mind (cognition) and body (physical action), and further help us understand how physical strain impacts cognitive abilities in everyday life.

## Theatre, Film and Digital Production

Faculty Mentor: **Dr. Erith Jaffe-Berg**

**Research Project:** Minority communities and late Medieval, Early-Modern Europe.  
Theatre and Performance.  
Multilingualism in Performance.

## COLLEGE OF NATURAL AND AGRICULTURAL SCIENCES

### Biochemistry

Faculty Mentor: **Dr. Paul Larsen**

**Research Project:** Our work is focused on improving crop growth in marginal soils. Students would participate in analyzing modified plants to determine whether they can survive in these environments and whether the changes can improve productivity.

## Biology

Faculty Mentor: **Dr. Chris Clark**

Research Project: (1) Examination of the aeroacoustic basis of the flight sounds of mosquitoes and flies: (2) wind tunnel experiments on the mechanics of how feathers flutter to produce sound.

## Botany and Plant Sciences

Faculty Mentor: **Dr. David Nelson**

Research Project: Plant molecular biology.

Faculty Mentor: **Dr. Fedor Karginov**

Research Project: Molecular and cellular biology of gene regulation by RNA-binding proteins.

## Chemistry

Faculty Mentor: **Dr. Chia-en Chang**

Research Project: The projects will focus on understanding the fundamental mechanism of molecular binding thermodynamics and kinetics using theory and classical mechanical models. Although our research involves the development and application of computational methods, the undergraduate researchers will focus on applying the computation tools to answer medically and chemically important questions. For example, students may help drug development or enzyme design projects.

Faculty Mentor: **Dr. James Davies**

Research Project: Title: New Methods to Characterize the Physical and Chemical Properties of Atmospheric Aerosol.

Description: Project will include the use of mass spectrometry and/or laser-based imaging to measure the properties and composition of single micron-sized aerosol droplets levitated in an electric field. Work will involve development, calibration and characterization of new methods and analytical tools.

Faculty Mentor: **Dr. Joseph Genereux**

Research Project: Development of mass spectrometry-based techniques to characterize cell-secreted protein conformation.

## Evolution, Ecology and Organismal Biology

Faculty Mentor: **Dr. Alan Brelsford**

Research Project: Evolutionary genomics of social organization in ants, hybrid zones and speciation genetics in birds and ants

Faculty Mentor: **Dr. Chris Clark**

Research Project: A test whether birds that produce loud non-vocal sounds have reduced vocalisations.

## Evolution, Ecology and Organismal Biology

Faculty Mentor: **Dr. David Reznick**

Research Project: 1. Genetics of adaptation in guppies - We are performing quantitative locus analysis experiments, in partnership with colleagues elsewhere who are doing the genomics, to begin to locate genes associated with the adaptive evolution of life history traits.

2. The evolution of placentas in the fish family Poeciliidae - the guppy family includes 250 species, some of which have the functional equivalent of placentas. We have already shown that the placenta has evolved at least nine times within the family and have identified close relative that either do or do not have placentas. We are engaged in experiments that characterize the consequences of placental evolution.

Faculty Mentor: **Dr. Alec Gerry**

Research Project: Students in my lab study blood-feeding insects that transmit pathogens to animals, or flies and other insects associated with animal production or forensic investigations. Undergraduate students can conduct research on forensically important insect species, specifically assessing their activity and behavior under field conditions, or rearing these species in the laboratory to learn about their life history and development requirements.

Faculty Mentor: **Dr. Sarah Woodard**

Research Project: Our research group studies the behavior and physiology of bumble bees. Potential projects will include laboratory research on life history traits and plasticity in queen bumble bees and fieldwork on wild bumble bees in the Sierra Nevada.

## Molecular, Cell and Systems Biology

Faculty Mentor: **Dr. Weifeng Gu**

Research Project: Develop techniques to purify pre-RNAs.

Faculty Mentor: **Dr. Ted Karginov**

Research Project: Molecular and cellular biology of RNA-binding proteins

Faculty Mentor: **Dr. Prue Talbot**

Research Project: Effect of electronic cigarettes and other tobacco products on health.

## Physics and Astronomy

Faculty Mentor: **Dr. John Barton**

Research Project: Highly mutable pathogens such as human immunodeficiency virus (HIV) pose a formidable problem for human health due to their ability to evolve resistance to drug treatment or immune responses that would otherwise effectively control disease. One of the aims of my research is to develop computational methods to learn about viral evolution from genetic sequence data, and to apply this knowledge to improve human health. Students with computational skills from any program are welcome. Learn about 1) research at the intersection of theory, computation, and biology, 2) reproducible research methods, 3) machine learning. For more, see bartonlab.ucr.edu.

Faculty Mentor: **Dr. Boerge Hemmerling**

Research Project: Developing electronics (PID controller, photodetectors, temperature monitoring systems).

## Physics and Astronomy - continued

Faculty Mentor: **Dr. Jory Yarmoff**

Research Project: Investigations of the Surface Properties of Novel Materials

## BIOMEDICINE -- FAMILY MEDICINE

Faculty Mentor: **Dr. Claudia Alvarez**

Research Project: - Factors contributing specialty practice in graduated family medicine residents

- Health disparities: poorly controlled glucose in immigrant endemic areas
- As above: ESRD in immigrant endemic areas
- Does early school intervention: middle school affect STI rates in teenagers from I.E.?
- Implicit bias.

Faculty Mentor: **Dr. Brandon Brown**

Research Project: I have 2 major research areas. One is in HIV and aging for a PCORI funded study in Palm Springs. Another is on research ethics and the use of incentives, which is funded by a NIH diversity supplement.

Faculty Mentor: **Dr. Mikio Nihira**

Women's Health – OB/GYN

Research Project: Today's medical environment—both in the academic and private practice—is challenging, complex, and unpredictable. The need for leadership has never been greater, and the demands on surgeons to lead are ever escalating. The purpose of this research is to systematically review the available literature regarding surgeons as leaders with the goal of identifying skills essential to effective leadership. The goal is to develop an intervention to train present and future surgeons.

## DIVISION OF BIOMEDICAL SCIENCES

Faculty Mentor: **Dr. Sika Zheng**

Research Project: Brain is the most sophisticated organ. Neuron is arguably one of the most morphologically complicated cell types in our body. Complex cells required complicated and unique gene regulation. Students will use cutting-edge technology (i.e. genome editing/CRISPR/Cas9, stem cell, imaging) to understand RNA regulation underlying the formation and the complexity of the brain.

## GRADUATE SCHOOL OF EDUCATION

Faculty Mentor: **Dr. Katherine Stavropoulos**

Research Project: Research participants in my lab would be able to observe diagnostic assessments for autism spectrum disorder, as well as potentially be involved in data entry of behavioral measures.

There are also opportunities to help with neuroscience studies with both children and adults.

## Graduate School of Education - continued

Faculty Mentor: **Dr. Parissa Clark**

Research Project: Restorative Justice and Culturally Relevant Pedagogy in Inland Empire School Districts among student teachers and mentor teachers.

Faculty Mentor: **Dr. Raquel Rall**

Research Project: Study investigating the qualifications, selection, and appointment of members of boards of higher education.

Research Project: Faculty Mentor: **Dr. Katherine Stavropoulos**

Research Project: Research participants in my lab would be able to observe diagnostic assessments for autism spectrum disorder, as well as potentially be involved in data entry of behavioral measures.

There are also opportunities to help with neuroscience studies with both children and adults.

## SCHOOL OF PUBLIC POLICY

Faculty Mentor: **Dr. Cecilia Ayon**

Research Project: The projects are all rooted in immigration policy. One project will examine how immigration policy impact family functioning among Latino immigrants. Another project will examine how immigration policy and anti immigrant sentiment impact health outcomes. A final project is a needs assessment of the needs of immigrants in the Inland Empire.

## SCHOOL OF BUSINESS ADMINISTRATION

Faculty Mentor: **Dr. Ashish Sood**

Research Project: Research topics related to Innovation management, International marketing, Marketing analytics, marketing-finance interface.

Faculty Mentor: **Dr. Ali Dehghan**

Research Project: Online customer acquisition for an aggressive app. This app can eliminate money from financial transactions.