Table of Contents

1. East Los Angeles College (pg. 2)
   a. Bryant Horowitz, Professor of Psychology
   b. Eileen Ie, Professor of Sociology
   c. Kashif Powell, Professor of Communication Studies

2. Los Angeles Valley College (pg. 4)
   a. Erika Brockmann & Pamela Byrd-Williams, Professors of Biology
   b. Ruby Christian Brougham, Professor Psychology

3. Pasadena City College (pg. 6)
   a. Jared Ashcroft, Chemistry & Brandon Rodriguez, NASA JPL
   b. Jorge Iniguez, Professor of Biology
   c. Veronica Jaramillo, Professor of Chemistry
   d. Juan Leon, Professor of Mathematics & Computer Science
   e. Miriam Hartman, Professor of Natural Sciences
   f. Michael Vendrasco, Professor of Geology
Mentor Bio — As a Behavioral Neuroscience PhD, my research has focused on both human and animal research on multiple behavioral disorders. In the past, my research has focused on cognitive testing of Alzheimer’s and Dementia patients, giving them cognitive tasks to assess their cognitive abilities, but the research also centered around the caregivers that take care of them. I have also looked at treatments for preventing the progression of Alzheimer’s and related dementia using natural supplements, such as DHA in fish oil, and curcumin, the yellowish ingredient in turmeric, used in curry, as well as the benefits of aerobic exercise. My research has also extended to Schizophrenia, where my experience dealt mostly with some of the symptoms of Schizophrenia, concentrating specifically on the cognitive deficits using animal models (mice). I also have experience testing patients with head trauma and assessments with patients with Multiple Sclerosis.

Background & Purpose — In this area, the main focus of the research is to help to identify, prevent, or find treatment for behavioral disorders of a psychological nature.

Research Question(s) or Hypothesis — Are there factors or things that can be done to prevent disorders from progressing? The working hypothesis is that exercise, physical and mental, as well as supplements can potentially serve a neuroprotective purpose and prevent onset or progression of dementia.

Method — In this context, we can offer exercise programs and do assessments for people at risk.

Student Roles — Within psychology, my areas of interest in research have expanded recently, and I can tailor opportunities to fit the needs of potential students. I have taken a big interest in the psychology of political affiliation and psychology, looking at differences socially and cognitively when voting a certain way or different belief systems involved. I am very interested in the stigma society gives to people based on issues such as immigration, gun control, helping or withdrawing help for certain groups, and whether the information is processed automatically, and if this would change at all if we somehow made people more aware of these biases and automatic processes. In this area, we can answer questions that address whether there is a difference in how people vote and their stance on certain issues, especially with regards to minorities and ethical issues, and if the process is an automatic, unconscious issue. The main hypothesis in this area is that people that identify as conservative choose to vote more out of fear-based decision making and cognitive processing, whereas liberals vote more out of information-based decision making. Previous research falls in line with this hypothesis, and imaging studies show more amygdala activation with "conservatives" and more prefrontal cortex activation in "liberals".

Expectations — Potential students would get in with me on the ground floor and come up with their own interpretations of the research questions in order to tailor their focus. They would help define the variables we will study and manipulate how we study them. The student will get a taste for the scientific method, including collecting and interpreting their own data, and an inside look at the statistical analyses used in research and how to interpret what the results mean and how they can explain them.

Conferences typically attended — The typical conference for this area is the Western Psychological Association conference (WPA), but I would also like to strive to go to the American Psychological Association conference (APA), and any others that would suit the needs of the students.


“No Health Without Mental Health”. National Publication distributed by The Chicago School of Professional Psychology in Spring of 2016.
**Eileen Ie, Professor of Sociology**

**Mentor Bio** — Congratulations on your acceptance to BUILD PODER! My background is in Sociology and Educational Psychology. Specifically, my emphasis is in the Social Psychology of Gender and Sexuality. I earned a bachelor’s and master’s degree in Sociology (minor in Human Sexuality) from CSUN and a doctoral degree in Education from USC. I have been a researcher since 2005 and joined the ELAC family in 2009. Currently I am interested in learning the sexual attitudes and behaviors of ELAC students. As a sociologist, the world is my lab. It’s my hope to work, learn, and grow together!

**Purpose** — To explore the sexual knowledge and behaviors of community college students. Most American college student health behavior research focuses on university students (Pokhrel, Little, Herzog, 2014) and 2-year or community college students have been less studied. According to the Center for Disease Control (2013), American youth bear a disproportionate share of sexually transmitted infections. While 15 to 24 year olds make up 27% of the sexually active population, they account for half of new STIs in the U.S. each year.

**Research question** — What is the sexual knowledge and behaviors of ELAC students?

**Method** — Survey questionnaires, in-depth interviews, and content analysis of student journals. Qualitative analysis and basic quantitative analysis.

**Student roles** — Student will assist with sampling, data collection, coding, and analysis.

**Expectations** — Students can expect me to be responsive and genuinely care about their academic and personal growth. What I expect from students is also what students can expect from me: to be open to learning content and process and to be respectful of timelines, to be communicative, and to be kind. My goal is to demystify the research process and to expose students to the messiness of research in real life. Students will gain knowledge through experiential learning. You have a lot to bring to this relationship and I will be learning from you just as you will be learning from me.

**Conferences** — California Sociological Association annual conference, ELAC Mujeres Xingona’s Conference, ELAC Global Awareness Conference.


---

**Kashif Powell, Professor of Communication Studies**

**Mentor Bio** — Dr. Kashif Powell is an artist, researcher, gardener, and activist. Emerging from his diverse interests, his work uses a wide range of methods to explore the relationship between health, race, and social mobility.

**Background & Purpose** — In the field of health, the understanding of race as genetic variance has pushed for a greater understanding of how health disparities fall along racial divides. My proposed research project aims to extend current research by considering how health disparities on the basis of race affect more than just an individual’s physical health. I posit that racial health disparities not only play a vital role in health indicators such as life expectancy, but also greatly affect social conditions such as educational attainment. Put simply, if African American students are healthy, they are more likely to succeed.

**Research Question(s) or Hypothesis** — “How do the health disparities of the African American community impact educational attainment?”—with “health disparities” being defined as “preventable differences in the burden of disease, injury, violence, or opportunities to achieve optimal health that are experienced by socially disadvantaged populations.”[1]

**Method** — The methodology for this study is two-folded: First, researchers will engage quantitative methods of communication research, including surveys, personal interviews, and statistical analysis. Second, researcher will also
engage qualitative methods of inquiry, namely ethnographic methods of data collections, i.e. collecting personal stories, video documentation, photography, and sound recording. To frame this study I utilize a method of Critical Ethnography, which uses participant-observation fieldwork to engage sites of cultural production. Critical Ethnography is an appropriate method because it structures our role as a participant-observers, and offers guidance for understanding the political impact of our study.

**Student Roles** — Students will be actively involved in the data collection phase of the research; they will learn both quantitative and qualitative methods of inquiry. Additionally, students will work on turning the results of the study into a conference hosted on the campus of East Los Angeles College. The conference will explore the themes of health, community, and social action.

**Expectations** — This project is intended to be interdisciplinary in nature. Though is it directly related to the hard sciences, the methods and discussions will be influenced by the social sciences, i.e. Political Science, Sociology, and Communication Studies.

**Conferences Typically Attended** — The Black and Brown Unity Conference, hosted by the Speech Lab at ELAC.

---

**Chander Arora, Professor of Biology**

**Background & Purpose** — Obesity is frequently cited as one of America’s more pressing public health problems. It poses the underlying threat to multiple and complex diseases. Although its incidence appears to be steadying, a substantial proportion of adult Americans remain obese. According to estimates from National Health and Nutrition Examination, several studies have linked obesity to an increased risk of chronic disease poor health-related quality of life, and functional disability. In fact, the public health impact of obesity has been shown to exceed that of two other behavioral problems, smoking and heavy alcohol use. Understanding obesity could be instrumental in understanding the common mechanisms of diseases. The project can be ramified into multiple directions. Behavioral modifications of significant risk factors could be recommended in presentations and publications. The purpose of this research is to explore gender-specific disparities in obesity of US born and foreign born youth. Funding to be explored from American Heart Association, government and private agencies.

**Research Question(s) or Hypothesis** — Identifying factors of obesity that are specific to gender and region.

**Method** — Questionnaires would be developed to collect data by personal interviews with equal number of young male and female subjects. Surveillance of behavioral risk factors in men and women of different races in college student population would be conducted using these questionnaires. Obesity is operationalized as having a body mass index (BMI) equal to or greater than the 95th percentile among individuals younger than age 18 years or a BMI of 30 or greater for individuals age 18 years or older. Examination of racial/ethnic disparities in obesity among U.S. - and foreign-born Whites, Blacks and Hispanics would reveal complex variations by sex and educational level. Comprehension of these relationships is vital for designing future obesity research and intervention strategies. The data would be analyzed for correlation of different risk factors and calculating odds ratios.

**Student Roles** — There is a wide spectrum of roles that students at each level can play. Review of literature and developing the questionnaires, could be developed by sophomores, interview questions and timing, data collection data entry and preservation could be done by juniors, data analysis, testing different models for males and females and presentation can be done by seniors. The roles could easily be exchanged between students based on their interest and capabilities.

**Conferences Typically Attended** — CSUPERB, Society of Reproductive Investigators (SRI), American Heart Association.
Mentor Bio — Professors Byrd-Williams and Brockmann are full time faculty within the Biology Department at Los Angeles Valley College. Both have worked in basic science research in cell, molecular and microbiology laboratories. They will be teaming up in a facility at LA Valley College that has the equipment necessary for tissue culture and microscopy techniques required for both projects.

Background & Purpose — We are interested in the antioxidant, anti-inflammatory and antimutagenic properties of Salvia hispanica seeds, commonly known as Chia seeds, on various types of mammalian cells. Recently, from various media sources, Chia seeds have been touted as the new “superfood”. It is high in omega-3 and omega-6 fatty acids, phenols and other antioxidants that are known to be anti-inflammatory but scientific research is still required to elucidate the mechanisms which confer health benefits at the cellular level. We propose two potential projects that will allow us to determine if the direct treatment of mammalian cells with Chia seed extract effect the activity of either Natural Killer (NK) Cells or macrophages. These are both cells of the immune system that are known to respond to tumor formations or presence of cancer cells. Both cells also produce cytokines which are important in cell signaling responding to events that include tumor formation, the inflammation and the anti-inflammatory responses. This research will apply to broad fields such as cancer, inflammatory diseases such as rheumatoid arthritis, Crohn’s disease & celiac disease with regards to nutrition as a supplement to other therapeutic or curative treatments.

Research Question(s) or Hypothesis

**Project 1:** Determine the effect of chia seed extract on the activity of activated mouse natural killer (NK) cells.

Does Chia seed extract effect their proliferation? Does it affect their production of cytokines Tumor Necrosis Factor alpha (TNF-a) or Interluekin-10 (IL-10)?

**Project 2:** Determine the effect of Chia seed extract on mouse macrophage production of IL-1 levels.

Student Roles

- Maintaining a detailed and accurate laboratory notebook
- Serial dilutions in dose dependency experiments
- Seed extraction & purification methods
- Tissue culture methods and techniques
- Aseptic techniques
- Media preparation
- Gel electrophoresis & Western blot techniques
- Microscopy (phase contrast, DIC, immunofluorescence)
- Review scientific literature
- Meet with mentors to discuss data interpretation and progress

Expectations — Students at any level can participate.

Conferences Typically Attended — Conferences may include American Society of Nutrition, American Cancer Society and SACNAS.
Ruby Christian Brougham, Professor Psychology

**Background & Purpose** — My research focuses on the relationship between language acquisition and the socio-emotional development of children between the ages of birth – 3.5 years.

**Research Question(s) or Hypothesis** — The main goals of the project are to use Critical Race Theory to identify elements of society, race, and culture that influence the understanding and expression of emotion in children ages birth-3.5 years. In particular, the use of positive and negative emotions expressed in language, the value placed on the displayed emotion by the parent or another child and the amount of cooperative behavior displayed by the child will be studied.

**Student Roles** — Students will be involved in all aspects of the research project and will be mentored as developing scholars. Students will work as part of a research team and will learn about research design, data collection, data analysis, and dissemination of research results through participation at a regional or national research conference along with manuscript preparation. Students will also have opportunities to work on innovative projects at the Family Resource Center and in some cases students will collect empirical data that subsequently informs a workshop.

**Expectations** — Involvement in research enhances the students’ ability to understand the merits of theoretical models, empirical data collection, logic-based arguments and aids in their integration and synthesis of new learning with existing information learned in the classroom, resulting in a richer and deeper understanding of psychology. Involvement in research also broadens the students’ professional options and helps them to prepare for graduate school and professional work. I plan to apply for an NIH pilot project grant.

---

**Pasadena City College**

**Jared Ashcroft, Chemistry & Brandon Rodriguez, NASA JPL**

**Mentor Bio** — Jared Ashcroft received a doctorate from Rice University in chemistry designing drug platforms using immuno-conjugates of carbon-based nanostructure. Currently I teach chemistry at Pasadena City College. My research group is designing and studying the affects of using Problem-based Learning in conjunction with a remotely accessible Scanning Electron Microscope in K-12 education. Specifically, we want to see if using this pedagogy can increase the interest in STEM for K-12 students, with an emphasis on underrepresented populations.

**Title of Research Project** — Education Equity: Using Problem-Based Learning in Tandem with a Remotely Accessible Scanning Electron Microscope to Close the Achievement Gap in the Science Classroom.

**Background & Purpose** — The development of a series of Problem-based Learning labs/activities that can be used in K-12 and undergraduate science courses. We want to bring active-learning and advanced technologies to the STEM classroom to promote student interest and success.

**Research Question(s) or Hypothesis** — Does active-learning used in tandem with remotely accessible instruments increase interest and success in the STEM classroom?

**Method** — We have developed summative assessments that are aimed at determining how much science content students have retained from their lab experience. We also have students do a formative assessment where they must draw what they have learned from using the Scanning Electron Microscope. Surveys are also done that measure how much student interest in the labs and passion for science increased using the Problem-based Learning pedagogy.

**Student Roles** — Students design the labs and assessments, attend and run the outreach sessions at the K-12 schools as well as perform data analysis from our surveys and assessments. Lastly, students are responsible for helping with writing the publications from our work.
Expectations — We expect our students to have a strong work ethic and to be an active contributor to the experience. Students must voice their thoughts and concerns for any experiment we perform. They must be vocal and contribute thoughtful discussion about the research. They must always be on time and be respectful for all that work with them on the project. My goal is to teach students to think and communicate effectively. I (Jared) especially expect my students to perform well in their classes and out importantly to have fun.


Publications
2. Jared Ashcroft, Jillian Blatti, Veronica Jaramillo and David Douglass; It DOES RAIN in Southern California. NANOWIRE Rain’s Quarterly Newsletter, Fall 2016.
4. Jared Ashcroft and Brandon Rodriguez; Using RAIN in Conjunction with Problem-Based Learning to Promote Student Success. NANOWIRE Rain’s Quarterly Newsletter, Fall 2017.
8. Jared M. Ashcroft, Ashley Min, Isabel Bojanini, Melanie Hacopian, Kristine Schroeder, Attila O. Cakmak, Brandon Rodriguez; Cultivating Mars: A Problem-Based Learning Lab Designing an Oxygen-Rich Environment on the Red Planet. Journal of Laboratory Chemical Education. 6, 1, 4-11, 2018.

Jorge Iniguez, Professor of Biology

Mentor Bio – My goal as a mentor is to ignite a passion for biology so my mentees want to become immersed in this field and pursue careers in biomedical research. I have mentored two undergraduates that later moved on to honors thesis independent research projects. The basis of project is to use genetic tools to determine how voltage gated calcium channels regulate olfactory information in adult Drosophila central nervous system (CNS). These results will contribute to our understanding of how the rapid and specific communication between neurons

Jorge Iniguez, Professor of Biology
and their peripheral targets is important in generating the appropriate behavioral response to a wide variety of external and internal stimuli.

**Title of Research Project** – Voltage gated calcium channels mediate calcium influx that influences a wide variety of cellular processes including excitability and chemical synaptic transmission in the nervous system and behavior.

**Background & Purpose** – Voltage gated calcium channels mediate calcium influx that influences a wide variety of cellular processes including excitability and chemical synaptic transmission in the nervous system. In vertebrates there are three major families of alpha1-subunit genes (Cav1, 2 and 3), some of which are functionally redundant. Drosophila has three genes, Dmca1D (1D), Dmca1A (cac), and Dmca1T (1T) encoding Cav1, Cav2 and Cav3 type channels respectively (Smith et al. 1996; Zheng et al. 1995; Littleton and Ganetzky 2000; King 2007). Null alleles in each of these genes result in embryonic lethality, demonstrating that they are not functionally redundant, but rather each plays a unique role in the organism (Eberl et al., 1998). However, there is no information regarding the role of the different calcium channel subtypes in regulating olfactory discrimination.

**Research Questions or Hypothesis** – All three calcium channel subtypes modulate Drosophila behavior.

**Materials and Methodology**

**Animals**- The fly stocks will be purchased from The Vienna Drosophila Resource Center (VDRC). The transgenic Drosophila melanogaster stocks will be maintained in a room illuminated with a 12-hour light/dark cycle and in a temperature of 23-25°C.

**Transgenic flies**– The Gal4/UAS system will be used to study gene expression and function in Drosophila. The GAL4 gene is placed under the control of a native gene promoter, or driver gene, while the UAS controls expression of a target gene. GAL4 is then only expressed in cells where the driver gene is usually active. The system has two parts: the GAL4 gene, encoding the yeast transcription activator protein Gal4, and the UAS (Upstream Activation Sequence), a short section of the promoter region, to which Gal4 specifically binds to activate gene transcription.

**Olfactory discrimination evaluation** – An equal mix of female and male flies will serve as subjects. Flies put into a maze through upper chamber. One arm has an odor and the other arm contains control air. Air will continuously be drawn through the system by a pump at 1liter/min. Air entering on arm passes through chemical odors and air entering the other arm goes through diluents example water. After a period of 1 minute, the # of flies will be counted.

**Expectations** – Students will be responsible for animal feeding, animal breeding, transgenic crosses, maintenance and general assistance with all experiments.

**Conferences Typically Attended** – Upon completion of these experiments results will be presented at meetings of the Society for Neuroscience, Genetics Society of America or Experimental Biology.

**Publications**


---

**Veronica Jaramillo, Professor of Chemistry**

**Mentor Bio** — Ph.D. (Chemistry), University of Arizona

**Background & Purpose** — Water quality is a big concern for a healthy life. It is proposed that we study tap water quality related to where students reside. Although this information is posted by water companies, most students are not aware of these reports. Most of our students either live at home with their parents or are renters, so they generally are exposed directly to the water quality reports.
Research Question(s) or Hypothesis — It is proposed that students will be more engaged in the issue by hands-on testing of their own tap water.

Method — After characterizing different tap water samples, we will map out the quality of the different tap waters versus location and have a greater discussion of the causes and implications. Water quality testing will include testing for nitrates, nitrites as well as heavy metals. Normal water characteristics will also be explored such as pH, conductivity, hardness and dissolved oxygen. After water has been analyzed, water purification techniques will be explored through the collaborative research project described eCure proposal.

Student Roles — Students will explore different water purification techniques, but focus on nanoparticle purification. This experience will enlighten students to cost and effectiveness of water purification. Pasadena City College students will be involved in water collection as well as water analysis. They will be trained in making standard solutions, performing spectroscopic studies and volumetric analysis.

Expectations — Students will begin their research during their General Chemistry course and be expected to continue with the research project for at least one year and submit applications to the national Conference for Undergraduate Research (NCUR) and the national American Chemical Society (ACS) meetings.

Conferences Typically Attended — Conference for Undergraduate Research (NCUR) and the national American Chemical Society (ACS) meetings.

Juan Leon, Professor of Mathematics & Computer Science

Mentor Bio — My main interests lie in physics based simulations, scientific computing, and computer graphics and animation.

Background & Purpose — My research opportunity involves the Oculus Rift Virtual Reality system to model molecular models and reactions. The purpose of this opportunity is to develop educational tools to help understand molecular reactions in 3D space. Many chemical and biological systems studied are complex and having technology that allows for observation of these systems in 3D space would help students visualize chemistry and biology in a way they have never been able to. For example, complex biomolecules, such as proteins, which fold in a highly organized way, could be seen whole in a 3d space as opposed to on screen or in a book.

Research Question(s) or Hypothesis — We will be trying to answer some questions such as what sort of physics based models can be used to model and display chemical reactions in a 3D space. We will look at both a molecular mechanics model as well as a quantum chemical model. We would like to look at mathematically describing the collisions and subsequent reactions. One of our main research questions is “How can existing molecular databases be incorporated in the VR environment to create a physics based molecular graphics model?”

Method — A group consisting of students and faculty from Pasadena City College and CSUN within the Chemistry and Computer Science Department will work together in building a framework for using VR simulations in a Science classroom. Initially, two CSUN and two PCC students will work on the molecular rift computer program with the aim of having the first molecule in a virtual reality by July 1, 2018. They will then work over the summer to have to molecules collide by November 1, 2017 and finally by July 1, 2018 have a successful reaction taking place.

Student Roles — At the sophomore level students will be working to place virtual models into the virtual world. At the junior level, students will program the molecules to collide with each other to simulate a possible reaction. At the senior level, virtual molecules will be designed to properly orient themselves in order to show successful chemical reactions. Senior students might also try to incorporate a simple quantum chemical model. In the case of all level of students, they will have the opportunity and expectation to program in the Unity environment, which uses the C# programming language.

Expectations — Students should have some experience with at least any one of the C++, Java, or Python programming languages.

Conferences Typically Attended — I typically attend the SIGGRAPH computer graphics conference.
Miriam Hartman, Professor of Natural Sciences

Background & Purpose — A pressing health concern in urban environments is the level of air pollution to which city-dwellers are exposed. Los Angeles has long been the poster child for air pollution; while the worst days of smog seem to be in the past, levels of pollution are far from ideal and appear again to be rising. In addition, there is evidence that poor air quality has the greatest impact on sensitive populations, such as children and the elderly, yet many locations where these individuals spend time (schools, apartments for seniors) are built in areas with major pollution problems. In addition, correlations between air pollution and low socio-economic status have been determined in several urban environments (citation1, citation 2). Recently, Google Street View cars were equipped with pollution-detecting equipment, and surveyed areas in both Oakland and Los Angeles, CA. This data is at higher resolution than any previous dataset of its size, and allows for study of correlations between pollution levels and geographic or demographic attributes, such as residential housing density, income level, and the ethnic makeup of a particular area.

Research Question(s) or Hypothesis — As noted above, studies have already shown that there is a correlation between pollution levels and poor neighborhoods. This dataset would allow such a study within the urban area of Los Angeles. Research questions would include: are there correlations between pollution and the location of schools where a large percentage of children receive a free or subsidized lunch? Of housing developments currently being built or planned, what fraction are in high-pollution zones? How far from major thoroughfares do high levels of pollution travel, and do these disproportionately affect low-income neighborhoods?

Method — The method would vary slightly depending on the research question being addressed, but all would utilize the Google data. In addition, demographic data, locations of schools, etc. will be determined using either datasets from data.gov or google.com. Students will extract data and place in a tabular/matrix format for ease of analysis. Initial analysis will be done graphically, plotting variables that are expected to show some correlation. Final statistical analysis will be determined using open-source software such as Python (NumPy).

Student Roles — Students would learn to manipulate the plethora of open-source data that are currently available, using software and tools that are applicable to a wide variety of topics and disciplines. Students will have hands-on experience at every step in the process, from distilling and formatting data to performing the mathematical and statistical analysis. Students will be encouraged to present their findings at conferences. Southern California Conferences for Undergraduate Research (SCCUR), local presentations at PCC.

Michael Vendrasco, Professor of Geology

Mentor Bio — Michael Vendrasco received a B.A. in Biology from UC Santa Barbara and a Ph.D. in Geology from UCLA. Since that time he has held adjunct teaching positions at UCLA and Cal. State Fullerton, and post-doctoral research positions at UC Santa Barbara and the University of Granada in Spain. He has also served as a Senior Environmental Specialist at the Orange County Sanitation District, and a Research Associate of the Los Angeles Museum of Natural History in the Department of Invertebrate Paleontology. He currently has a full-time position at Pasadena City College and teaches Physical Geology, Historical Geology, Oceanography, Oceanography Lab, and field courses.

Research Project Title — Monitoring plastic and toxic pollutants in southern California beaches

Background & Purpose — Beaches accumulate pollutants in water and sediment. These pollutants pose health risks to beachgoers, who are especially plentiful in Los Angeles and Orange counties. It is important to determine the geographic and temporal patterns of pollutant concentrations in these regions, in order to: better estimate the range of probabilities of health impacts at different beaches; better predict when certain beaches will contain higher concentrations of pollutants; and ultimately determine the causes of high accumulations of pollutants at specific beaches.

Research Question(s) or Hypothesis
(1) How and why do densities of microplastics vary in the sands of beaches in Los Angeles and Orange Counties? How
do densities vary through time at specific beaches? Which environmental toxins become attached to these microplastics?

(2) How do concentrations of dissolved **heavy metals** vary in **waters** off beaches of Los Angeles and Orange counties? How do these change through time? What factors contribute to these patterns?

(3) How do concentrations of **heavy metals** in the **sediment** vary among beaches of Los Angeles and Orange counties? How do these change through time? What factors contribute to these patterns?

**Method**

(1) Beach microplastics
Sediments will be collected at beaches in Los Angeles and Orange Counties. A sediment corer will be used for an analysis of changing concentrations of microplastics over time. Beach sediment samples will be examined and characterized via microscopes. The density of microplastics and other anthropogenic debris will be measured and recorded for each sediment layer at each locality. Potentially toxic coatings around the microplastics will be observed at a very-fine scale via Scanning Electron Microscopy with elemental analysis and Atomic Force Microscopy, and attached molecules will be identified via Mass Spectrometry.

(2) Beach water quality
Water samples will be collected systematically at beaches in Los Angeles and Orange Counties. These samples will be analyzed by Inductively Coupled Plasma Mass Spectrometry in order to record concentrations of dissolved metals Cadmium, Chromium, Copper, Manganese, Nickel, Lead, and Zinc.

(3) Metals in nearshore sediments
Sediments in shallow subtidal nearshore regions will be collected using a sediment corer. The sediments will be digested using Aqua Regia in a High Pressure Microwave System. Concentrations of the metals Cadmium, Chromium, Copper, Manganese, Nickel, Lead, and Zinc will be measured using Inductively Coupled Plasma Mass Spectrometry.

**Student Roles** — Students may participate in the entire research process, including: working to design a specific project within the research framework; doing background literature research; collecting and analyzing data; and contributing text and/or diagrams to a manuscript for publication.

**Expectations** — Students may develop their own research projects within the research framework presented here. The aim is for students to experience all steps of the research process. For their part, students must be willing to meet weekly and have the time and enthusiasm to consistently work on the project. Students must be willing to invest in the project and genuinely care about its quality.

**Conferences Typically Attended** — Geological Society of America (GSA) Annual Meeting, Society for Sedimentary Geology (SEPM)/AAPG Annual Meeting.

**Publications** — For publications, please visit my Research Gate profile.