SURF SMART 2020 Graduate Mentor Research Projects

For the SURF SMART 2020 Program, there are a total of twenty graduate mentor research projects from a variety of disciplines. This page and the next provide an overview in table form of these research projects; more detailed descriptions follow this overview.

Academic Program	Research Project Title	Graduate Mentor
Civil & Environmental Engineering	Developing an Air Cathode Assisted Iron Electrocoagulation System to Remove Arsenic from Contaminated Drinking Water in Central California	Dana Alejandra Hernandez
Education	Puzzling Proofs: Navigating Proof Construction and Communication in Middle school	Vasiliki Laina
Environmental Science, Policy, & Management	Undergraduate Research in Soil Health and Agroecology	Aidee Guzman
Environmental Science, Policy, & Management	Effects of Low Flow on Sierra Nevada Stream Food Webs	Kyle Leathers
Environmental Science, Policy, & Management	Beach Flies of Hawaii	Nina Pak
Environmental Science, Policy, & Management	Fish Foraging Behavior in Different Stream Habitats	Rachael Ryan
Film & Media	Moving-Image Evidence in the Turn-of-the-Century Courtroom	Tory Jeffay
Integrative Biology	Evolution of Elaborate Design in Weaverbird Nests	Jackie Childers

INTEGRATIVE BIOLOGY	Seed Germination and Microbe Occupation: How Do Seed Microbe Communities Differ across Plant Species and What Does It Mean for Plant Health?	Mason Chock
INTEGRATIVE BIOLOGY	Adaptive Radiations in Turtle Skulls	Peter Kloess
INTEGRATIVE BIOLOGY	The Role of Hybridization in Generating Weird Fish Faces in Caribbean Pupfish	Emilie Richards
INTEGRATIVE BIOLOGY	The Downstream Effects of Novelty: Did the Evolution of Scale-Eating Affect Mate Preferences in a Radiation of Bahamian Pupfish?	Michelle St. John
INTEGRATIVE BIOLOGY	Is Sharing Caring? Investigating the Role of Horizontal Gene Transfer in Insect Fitness	Kirsten Verster
INTEGRATIVE BIOLOGY	The Monoculture Effect – Host Genetic Diversity and Infectious Disease Evolution	Elisa Visher
INTEGRATIVE BIOLOGY	Comparative Jumping Biomechanics of California Squirrels	Lawrence Wang
MATERIALS SCIENCE & ENGINEERING	Mussel-Inspired Polymers for Mucosal Drug Delivery	Arianna Avellan
NEAR EASTERN STUDIES	A Corpus Analysis of Akkadian Metaphors	Matthew Ong
PHYSICS	Searching for New Superconductors: Transition Metal Oxides	Nikola Maksimovic

PUBLIC HEALTH	Examining Human Toxicity of Agricultural Pesticide Use in California	Carly Hyland
SOCIAL WELFARE	Why Self-Love & Connectedness Matters: Enhancing Positive Outcomes among Transition-Age Youth	Mayra Cazares

SURF SMART 2020 CIVIL AND ENVIRONMENTAL ENGINEERING PROJECT (1)

Developing an Air Cathode Assisted Iron Electrocoagulation System to Remove Arsenic from Contaminated Drinking Water in Central California (Dana Alejandra Hernandez)

Arsenic is a toxic carcinogen causing multiple forms of cancer and low IQ in children. In California, about 55,000 people are exposed to high levels of arsenic via their community water systems. As current technologies are too costly or complex to implement, the Gadgil lab is developing an affordable and effective technology, called Air Cathode Assisted Iron Electrocoagulation (ACAIE) at community scale.

In this project, to test ACAIE outside of the lab, we are working with an elementary school in Central California that is currently out of compliance in terms of the arsenic in their drinking water. The project's summer focus is on field implementation and engineering design to test the efficacy of ACAIE in removing arsenic from real California groundwater.

The selected mentee will assist our team in setting up the 6-week field trial in Central California, monitoring water quality parameters, and evaluating technology performance over time. At the UCB lab, they will utilize analytical instruments to characterize the treated water from the field and to help improve the technology based on reactor design and operating conditions. The SMART mentee will gain valuable field experience and problem solving in settings outside of a controlled laboratory setting.

SURF SMART 2020 EDUCATION PROJECT (1)

Puzzling Proofs: Navigating Proof Construction and Communication in Middle School (Vasiliki Laina)

Recent reforms in STEM education argue for students' engagement in disciplinary practices, such as the construction and communication of a mathematical proof. Researchers have argued that some of the difficulties students face with proofs in particular, may stem from their limited opportunities to engage in productive disciplinary practices, such as successfully employing multiple forms of reasoning when constructing a proof (Boero, 1999; Pedemonte, 2007).

In this project, we will explore how educators can support proof construction and communication in middle school that may encourage the use of multiple forms of reasoning through non-linear explorations. Using qualitative methods, we will study young learners' reasoning patterns and disciplinary practices as they participate in innovative puzzle-like proving activities. We will pay particular attention to the role of material and social configurations that may influence young students' equitable opportunities for participation in productive disciplinary practices.

By the end of the program, you will have (i) contributed to the development of coding rubrics, (ii) coded video data and transcript, (iii) practiced how to support a claim with data, and (iv) contributed to writing a conference proposal. No prior experience or skills required; just an interest in improving STEM education!

SURF SMART 2020 ENVIRONMENTAL SCIENCE, POLICY, & MANAGEMENT PROJECTS (4)

Undergraduate Research in Soil Health and Agroecology (Aidee Guzman)

My research asks, how can agriculture work for both people and in the environment? Through field, greenhouse, and lab work, my research explores how diversified farming practices influence soil health, particularly arbuscular

mycorrhizal fungi (AMF) and wild bee communities. In the field, we are working with small-scale farmers of color embedded in the monocultural landscape of California's San Joaquin Valley and investigating how their farming practices influence soil and pollinator health. In the greenhouse, we are conducting greenhouse experiments to determine the mechanistic connection between AMF and bees. In the lab, we are processing samples collected from the field and greenhouse to determine microbial composition of soil samples using molecular methods and nutrient properties of soil and plant samples.

Through any of these aspects of my soil health and agroecology research, the undergraduate researcher, regardless of their background and experience, will be encouraged to develop and implement their own project. Specifically, undergraduates will have the opportunity to carry out a project in the context of existing research or an independent study in the field or greenhouse. The student will be supported in learning new field and lab methods (from soil science to microbial ecology), coding tools for data analysis, and communicating science in the Berkeley Agroecology Lab.

Effects of Low Flow on Sierra Nevada Stream Food Webs (Kyle Leathers)

Sierra Nevada snowmelt is predicted to occur up to two months earlier by 2080, but we do not know how aquatic food webs will respond. Changes in snowmelt timing could decrease stream insect abundance and biodiversity via increased temperature and duration of low flows. My goal is to understand how extended low flows alter stream food webs. I collected samples from nine artificial streams that had different durations of low flow this past summer. An undergraduate researcher is needed to help sort and identify these samples, which will ultimately result in an extensive dataset that will include temperature, discharge, light, community composition, primary production, trophic position, insect community growth rates, body size, and emergence timing.

The undergraduate is expected to develop and answer their own research question related to the project. They will do this by becoming familiar with literature related to the project, sorting and identifying samples of aquatic insects, learning basic data analysis skills in R, and presenting their findings at a research symposium. No prior experience is needed for this position, but willingness to use a microscope for hours at a time and interest in aquatic ecology are essential.

Beach Flies of Hawaii (Nina Pak)

A provisional list of Canacidae (Beach Flies) from Hawaii has been collected over this past summer. Improvement upon the phylogeny across Canacidae can be used as a hypothesis-testing framework on how flies have adapted to multiple ecological niches from saline environments to freshwater ecosystems. While many of these flies are found around the world, one lineage in the Hawaiian Islands has lost the ability to tolerate saline habitats and currently occupies high elevation freshwater streams. Organizing collection information, examining DNA sequences, and developing identification keys to this important group will bring us closer to understanding the impressive biodiversity of these tropical islands.

This project will involve curating a large number of fly collections from Hawaii, but mainly using molecular lab techniques to uncover the genetic diversity across this fly family. Students will learn about fieldwork, natural history museums, sorting and identification techniques, sample preparation, GIS mapping, insect curation, and focus mainly on molecular lab techniques (DNA extractions, PCRs, and phylogenetic analysis). The student will be exposed to concepts in evolution, ecology, entomology, and basic R-programming for data analysis and bioinformatics, but no previous experience is required.

Fish Foraging Behavior in Different Stream Habitats (Rachael Ryan)

Habitat diversity in a watershed can support diverse biological communities, as well as promote diverse traits and behaviors within a population. This project will investigate if juvenile coho salmon *(Oncorhynchus kisutch)* alter their foraging behavior in different stream habitats, using underwater video footage. This work will be part of a larger study that aims to understand whether diverse physical habitats within Lagunitas Creek, Marin County give rise to trait diversity within an endangered coho salmon population. There are two primary objectives of this undergraduate study: 1) observe and assess juvenile coho foraging behaviors and classify into distinct categories; 2) relate foraging strategies and variation in these strategies to habitat type.

No previous experience is required for this position, but students should be comfortable in and around water and potentially working in remote locations. Time will be split between field work on Lagunitas Creek and lab work on campus. When in the field, the student will participate in data collection, including physical habitat surveys on the stream, algae and aquatic macroinvertebrate collection and camera set-up to capture underwater footage of fish foraging. Accommodation will be provided at the UC Point Reyes Field Station while working in the field. In the lab, the student will design their own methodology to subset and analyze the video footage from the field. They will be responsible for designating behavior types and recording data on individual foraging behaviors for each habitat, then analyzing the data and

presenting their results. At the end of the summer, a summary of the project will be presented at an ESPM Freshwater Group lab meeting to practice scientific presentation skills and receive feedback.

SURF SMART 2020 FILM AND MEDIA PROJECT (1)

Moving-Image Evidence in the Turn-of-the-Century Courtroom (Tory Jeffay)

New technologies such as police body cameras and deepfake algorithms have recently put questions of photography's value as evidence in the spotlight. However, photographic technologies have been part of the courtroom since the mid-nineteenth century. My dissertation turns to the emergence of photography and cinema as evidentiary tools in the courtroom in an attempt to uncover the preconditions of our current moment of mediated justice.

The SURF-SMART research assistant will help advance the larger project by constructing a newspaper archive for significant early court cases involving moving-image evidence, seeking to answer the question of how film entered American courtrooms. This will involve writing summaries of cases, compiling timelines of events, and identifying significant characters. The work will initially draw from campus collections and online newspaper databases. There will also be the opportunity to undertake further research at other local institutions in the Bay Area and Sacramento. Past experience with archival research is useful but not required. Applicants should have an interest in the history of media, law, or turn-of-the-century America; an attention to detail; an eye for detecting interesting nuggets within a sea of newsprint; and strong writing skills. The SURF-SMART assistant will gain the necessary research skills needed to undertake a large-scale archival project in the humanities.

SURF SMART 2020 INTEGRATIVE BIOLOGY PROJECTS (8)

Evolution of Elaborate Design in Weaverbird Nests (Jackie Childers)

Nest structures are widespread across animals and yet are one of the most understudied components of avian life history. Some of the most remarkable examples of elaborate nest design are within the Weaverbirds (Ploceidae), an Old World family of birds containing over 100 species, making them an ideal model system for studying patterns of biodiversity. While it is known that each species constructs a uniquely designed nest, the evolutionary factors that influence design are unknown. Research questions to address include:

1.) What are ancestral versus derived nest characters?
2.) Are architectural innovations in nest design related to species diversification within the Ploceidae?
3.) What role does bill morphology play in nest design?

As part of the SURF SMART mentorship program the undergraduate mentee will work as a research assistant whose primary goal will be to collect essential morphological data from preserved specimens at the UC Berkeley Museum of Vertebrate Zoology (MVZ). In addition, the student will provide laboratory assistance in the extraction of DNA from tissue samples, work that will be performed in the Evolutionary Genetics Laboratory in the Valley Life Science Building (VLSB). As part of this work the student will learn a variety of skills including: 1.) the proper handling and treatment of museum specimens 2.) technical skills in the use of standard research equipment 3.) quantitative and phylogenetic analysis using statistical software and the programming language R.

Seed Germination and Microbe Occupation: How Do Seed Microbe Communities Differ across Plant Species and What Does It Mean for Plant Health? (Mason Chock)

The development of seeds and seedlings represent perhaps the most critical stage of a plant's life. Within and on seeds live a multitude of bacteria and microfungi that can either deteriorate (pathogens) or improve (mutualists) seedling health. Seed microbes can be transmitted from both the surrounding environment (horizontal transmission) as well as from their mother plant (vertical transmission). This maternal inheritance gives seed microbes priority in the colonization of plant tissue once germination occurs. This can significantly affect the trajectory for future adult plant microbiome composition and plant health.

The larger project with which this SURF SMART project is affiliated is focused on this idea of seed microbe inheritance and looks to see how transmission of microbes differs across plant species. Overarching themes of the project include mechanisms of vertical seed microbe transmission (mother to offspring), seed microbe community assembly, and application of beneficial seed microbes to increase plant health. The specific goals of the SURF SMART mentee project

include: 1) Measuring seed traits across various plant species (permeability, seed coat thickness, and nutrient content), 2) Isolating bacteria and microfungi from these various seeds, and 3) Analyzing what seed traits affect microbe transmission and composition. The mentee will become proficient in microbe culturing, DNA sequencing, microbiome transplants, and horticulture and conservation practices. A general background in general biology, PCR, and microbe culturing is preferred.

Adaptive Radiations in Turtle Skulls (Peter Kloess)

My research seeks to understand the morphological relationship between the bony and keratinous portions of the turtle feeding apparatus, as well as their relationship to diet and habitat. Through this summer research opportunity, undergraduate researchers will focus on a subset of these turtles to test hypotheses at a finer taxonomic level with the goal of exploring the morphological variation within this taxon. To identify variation in skull shape, undergraduate researchers will first be trained to select appropriate specimens from institutions across the Bay Area, such as the UC Museums of Paleontology and Vertebrate Zoology and the California Academy of Sciences, and they will learn to collect scientifically useful photographs and detailed notes for use in later analyses. Additionally, some of these specimens will be brought to the Berkeley Preclinical Imaging Facility for computed tomography (CT) scanning. With the observational data collected from photographs and CT scans, students will be trained to use visualization software to digitize and analyze turtle specimens. Throughout the course of this research project, students will have the opportunity to gain training in evolutionary biology, experimental design, CT scanning, and collections-based research. Students must have taken introductory biology courses and have an interest in comparative morphology.

The Role of Hybridization in Generating Weird Fish Faces in Caribbean Pupfish (Emilie Richards)

While hybridization has historically been thought to hinder evolutionary processes, the idea that it might sometimes drive evolution instead has been gaining momentum in recent years, even in modern day humans! Hybridization can sometimes result in extreme traits not observed in the parental species that allows hybrids to occupy new environments or eat new things. I am looking for an undergraduate research assistant to help me address questions about how hybridization has impacted a group of Caribbean pupfish that have specialized on weird diets, like fish scales! This researcher will help me take measurements on a suite of traits related to these specializations (e.g. jaw size, nasal protrusion, cranial height) in hybrid fish from experimental crosses and assess whether hybrids have more extreme trait values than their parent species using basic statistical hypothesis tests. Applicants do not need any previous research experience or specific skills to work on this project with me, just enthusiasm and an attentive work ethic. They will gain experience with morphometrics, statistical thinking, R programming, and data visualization. This project is an excellent chance to dive into research for the first time and learn more about fish and evolutionary biology.

The Downstream Effects of Novelty: Did the Evolution of Scale-Eating Affect Mate Preferences in a Radiation of Bahamian Pupfish? (Michelle St. John)

Novel traits (i.e. new traits or behaviors that allow organisms to perform a new function) have long fascinated biologists. Their evolutionary origins, however, are poorly understood and may involve changes in multiple behaviors and traits. The effects of these changes do not occur in a vacuum and may have downstream effects on other processes—such as the formation of reproductive barriers between groups. My research investigates the relationship between the evolution of novel traits and the formation of reproductive barriers using the scale-eating pupfish.

Scale-eating is an example of a novel diet, and involves changes in multiple traits such as aggression, feeding behavior, and jaw morphology. Whether these changes affect the formation of reproductive barriers (i.e. mate preference) between scale-eating pupfish and other pupfish species is still unknown.

For this summer research opportunity, I am looking for an undergraduate research assistant to collect mate preference data for scale-eating pupfish, testing whether they prefer mates with large or small jaws. If chosen, a researcher will gain experience in animal care and data collection (running behavioral assays on three pupfish species), data analysis (basic stats and experience in R programming language), graph production, and experience in data presentation by creating and presenting a poster detailing the project. No previous experience is required for this project.

Is Sharing Caring? Investigating the Role of Horizontal Gene Transfer in Insect Fitness (Kirsten Verster)

You may have heard the phrase "You look just like your mother," but how often have you heard "You look just like a bacteria"? The former is an example of the type of genetic inheritance most of us are familiar with, *vertical,* or inheritance from parents to offspring. This project, however, involves *horizontal* inheritance: that is, the exchange of genes between species, otherwise known as horizontal gene transfer (HGT). The project I propose for an undergraduate involves investigating how and why a horizontally transferred gene was transferred from viruses to insects several million years ago. (For background, please read Verster et. al. 2019, *MBE*).

There is no reason for a horizontally transferred gene to persist in an animal's DNA unless it serves some sort of function. This is what I am investigating: what does this HTG *do* in insects? I created several mutant flies using CRISPR that have the HTG "knocked out." Students will spend the summer comparing fitness between mutant flies and wild-type ("normal") flies to investigate the role of HGT in insect fitness by measuring fecundity, survival, and parasite resistance.

Students will learn basic techniques in molecular biology including DNA extractions and PCR as well as fly care and rearing. No prior research experience or skills are necessary, just attention to detail and a love of the natural world.

The Monoculture Effect – Host Genetic Diversity and Infectious Disease Evolution (Elisa Visher)

Interactions between infectious diseases and their hosts underpin a vast array of ecological and evolutionary dynamics. These host-parasite interactions are thought to contribute to the maintenance of genetic diversity in animal, plant, and insect hosts. One important factor in this is called the 'monoculture effect' where genetically homogenous host populations may select for more virulent pathogens.

This project seeks to test the monoculture effect in the Boots lab's *Plodia interpunctella* (Indian Meal Moth) and granulosis virus model system. This year, myself and a team of URAP students have been experimentally evolving virus on both genetically homogenous and genetically diverse host populations of *P. interpunctella*. Experimental evolution will conclude late this spring, so the SMART student will be primarily responsible for leading infectivity and productivity assays of evolved virus lines. Through this project, the SMART student will learn skills associated with general lab maintenance and citizenship, animal husbandry, experimental evolution, sterile microbial techniques, and viral infectivity and productivity assays. The student will also have the opportunity to learn about concepts associated with infectious disease evolution, experimental evolution, and the monoculture effect through guided readings.

Qualifications: The applicant must be organized, reliable, independent, and have good communication skills. Previous research experience is a plus, but not required. Biology majors and students with demonstrated interest in evolutionary biology and infectious diseases would be preferred.

Comparative Jumping Biomechanics of California Squirrels (Lawrence Wang)

Squirrels are extremely agile, comprise the second-most diverse group of rodents, and have colonized a wide range of environments across five of the seven continents, making them an ideal group in which to study the evolution of arboreal locomotion. I am interested in understanding how their form (morphology), how they move (kinematics) and how they learn and adapt (cognition) help them navigate the complex environments they live in.

Over the summer, I plan on complementing my current work on squirrel foot morphology and fox squirrel biomechanics with a comparative study of equivalent biomechanical tests and morphological measurements in live-caught semi-arboreal chipmunks from the Sierras that we will house at the Sierra Nevada Aquatic Research Laboratory (SNARL). This will involve designing and building jumping setups, field-trapping of chipmunks, camping in the Sierras, animal care, and high speed-videography and analysis.

The undergraduate will have the opportunity to work with live animals and learn and practice a wide range of techniques including animal husbandry, experimental design, small mammal trapping, video processing, data processing in MATLAB, as well as designing and constructing setups for biomechanical tests. The student should be comfortable working outdoors, and previous experience would be helpful but is not necessary.

SURF SMART 2020 MATERIALS SCIENCE & ENGINEERING PROJECT (1)

Mussel-Inspired Polymers for Mucosal Drug Delivery (Arianna Avellan)

Mussels have the ability to adhere to wet surfaces through the byssus, a collection of protein-based threads, that are formed by the mussel's foot. The undergraduate student will help me investigate the use of mussel-inspired adhesive moieties to enhance contact and retention of polymers on mucosal tissues. In particular, we plan to use our mucoadhesive drug-loaded particles to explore the new concept of drug-induced regenerative medicine, wherein adult mammals are able to regenerate tissues in a scarless manner. The resulting mucoadhesive polymers will be useful in the future for treating ocular and oral diseases. The two main projects the student will work on will be studying (1) the drug release profile and degradation time of drug filled mucoadhesive microparticles as the concentration of the drug is altered and (2) cytotoxicity of the loaded and unloaded mucoadhesive particles on human derived cells. The student will learn about materials characterization, synthesis of microparticles for biological applications, cell culture basics, and data analysis through a set of different experiments designed to help us optimize our mucoadhesive drug loaded particles. Previous cell culture experience is recommended, but not required. The internship will conclude with a 15-minute presentation of their findings.

SURF SMART 2020 NEAR EASTERN STUDIES PROJECT (1)

A Corpus Analysis of Akkadian Metaphors (Matthew Ong)

This project involves constructing an online database of metaphors in Akkadian, one of the main languages of ancient Mesopotamia. The work is part of my Ph.D. thesis, which looks at distinctive literary features of Akkadian literature. We will both analyze the internal structure of these metaphors and their distribution within a corpus of cuneiform texts. The theoretical analysis of the metaphors will be based on George Lakoff's Conceptual Metaphor Theory (CMT), while the distributional analysis will use a data visualization program called Gephi.

Our online database will be based on a MetaNet (https://metaphor.icsi.berkeley.edu/pub/en/), a project initiated by the UCB Department of Linguistics for understanding metaphors in English. Using an analysis template drawn from MetaNet, we will take Akkadian texts from Open Richly Annotated Cuneiform Corpus (aka Oracc, http://oracc.museum.upenn.edu/) and identify the conceptual metaphors within them, noting such things as the source and target frames, hierarchical relationship with other metaphors, and whether the metaphor is experientially basic or not.

Once this database is constructed, we will use Gephi to answer questions such as what metaphors co-occur in a text of a given type, what cultural domain the metaphors come from, and how metaphor usage relates to genre.

Our goal for the summer will be to fill our database with metaphors drawn from several hundreds of Akkadian texts on Oracc, sufficient for a dataset that can be profitably interpreted using Gephi. The results from this analysis and a basic explanation of our work method will constitute the final poster presentation.

The mentee will work alongside me identifying and analyzing metaphors in translated Akkadian texts using CMT. This work will include independently identifying a metaphor's basic attributes using CMT, entering that information into the database, and using Gephi to come up with hypotheses about how metaphor distribution relates to text type and conceptual domain. The mentee will also be partly responsible for designing the final poster and giving the oral presentation.

The mentee can be expected to learn the basics of CMT, the basics of network analysis using Gephi, and basic cultural concepts specific to ancient Mesopotamia. The background most suitable for this project would be either linguistics, computer science with secondary interest in linguistics, or philosophy of language/literary studies. Note that no knowledge of Akkadian is required.

SURF SMART 2020 PHYSICS PROJECT (1)

Searching for New Superconductors: Transition Metal Oxides (Nikola Maksimovic)

Superconductors are materials where quantum mechanical interactions between the constituent electrons induce a state with *zero* electrical resistance. They are often used in MRI machines and precision magnetometers. However, their applicability is hindered by the requisite cryogenic temperatures. Therefore, the discovery of novel superconductors that operate at higher temperatures is of tremendous fundamental and practical interest. This project focuses on inducing superconductivity in a class of materials called the "delafossites", some of which have been theoretically predicted to host superconductivity under certain conditions.

The undergraduate will work closely with me at Lawrence Berkeley Lab, where we will systematically develop a growth recipe for delafossite oxides by iterating on published techniques in the literature. The undergraduate will learn the physics behind each of our characterization tools (magnetization, x-ray diffraction, resistivity, etc.) and the microscopic insight each of them provides. The undergraduate will also gain practical experience with single crystal synthesis.

An undergraduate level thermodynamics course is recommended but not required. At the end of the summer, the undergraduate will be expected to give a 30-40 min informal technical talk on the status of the research project at a group meeting.

SURF SMART 2020 PUBLIC HEALTH PROJECT (1)

Examining Human Toxicity of Agricultural Pesticide Use in California (Carly Hyland)

Pesticide use trends in California have shifted drastically in recent decades. As neurotoxic pesticides such as organophosphates and carbamates have been phased out of agricultural use, they have been replaced by other pesticides such as pyrethroids, neonicotinoids, and glyphosate (the active ingredient in RoundUp). However, little is known about the relative toxicity of the pesticides that are currently being used most heavily in agriculture. No previous studies have evaluated total pesticide toxicity over time, including whether cumulative toxicity has

shifted in conjunction with changes in the types of pesticides being applied. Additionally, no previous studies have assessed trends in use of organic pesticides and potential implications for toxicity. This project seeks to examine the total toxicity to humans of agricultural pesticide use in California and Monterrey County from 1990-2017. The SURF SMART intern will be responsible for analyzing data from California's publicly available Pesticide Use Reporting (PUR) database. The SURF SMART intern will calculate potential human toxicity of agricultural pesticide use and evaluate trends over time by combining information from the PUR data, including the pounds of specific pesticides applied and area of crop land sprayed, with an indicator of the toxicity of each pesticide. This work has important implications for pesticide regulation and may help identify the safest pesticide replacements.

Qualifications: Students with a demonstrated interest in environmental science or public health preferred. Some data analysis experience preferred.

SURF SMART 2020 SOCIAL WELFARE PROJECT (1)

Why Self-Love & Connectedness Matters: Enhancing Positive Outcomes among Transition-Age Youth (Mayra Cazares)

This project will focus on transition-age youth (TAY) in the foster care system. TAY are among the most vulnerable young adults in our society and are at increased risk for various negative outcomes including homelessness and low educational attainment. Although the child welfare system is concerned with improving their outcomes, it has not considered how their histories of maltreatment and foster care may impact their self-love and their subsequent relationships with adults. This project will employ a mixed-methods approach and aims to:

1. Examine the impact of maltreatment and foster care on youths' self-love and social networks.
2. Examine the impact of self-love and social network characteristics on youth's outcomes.

Research experience is preferred but not required; training will be provided. Research activities and responsibilities include:

1. Recruiting, surveying, and interviewing youth.
2. Entering and cleaning data using Excel and STATA.
3. Transcribing and coding interviews.

The mentee will exit the project with the fundamentals of how to conduct qualitative/quantitative research in a difficult-to-reach population of youth focusing on socioemotional well-being. The mentee will have the opportunity to develop a poster presentation and/or write a publication on this research. The mentee is expected to regularly meet with mentor over the summer to debrief about their progress in the project as well as for mentorship on professional- and career-related topics.