18th Annual

Ronald E. McNair Scholar

Undergraduate Research Symposium

Friday, June 2nd, 2017

Presented by

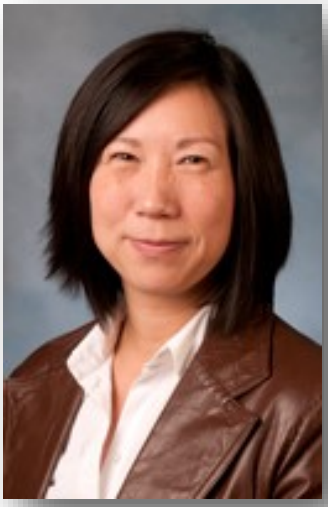
Cal Poly Pomona's

McNair Scholars Program

"Whether or not you reach your goals in life depends entirely on how well you prepare for them and how badly you want them."

- Dr. Ronald E. McNair

A Message From The Director



Dr. Winny Dong

Welcome to the Eighteenth Annual Ronald E. McNair Postbaccalaureate Achievement Program Symposium and Luncheon. I thank you for joining us in celebrating the achievements of our McNair Scholars, and I congratulate all the Scholars and Mentors for the wonderful presentations this morning.

The McNair Scholars Program has brought great distinction to Cal Poly Pomona, and the program continues to provide student Scholars with valuable research experience and encouragement that give them a distinct advantage when they undertake the demands of graduate school. The McNair Scholars Program has been a model for promoting academic success and for ensuring that underrepresented students pursue doctoral studies. Most of our Scholars hail from low-income, first-generation college backgrounds, and they have overcome economic, social, and cultural barriers on their academic journey. Few aspects of human endeavor are more stimulating than actions that nurture intellectual creativity among young individuals.

As Director of the program, I have had the privilege to interact with exceptional students, faculty, staff, and administrators. We are fortunate to have a wonderful staff and I am consistently awed and humbled by their dedication to the scholars.

I want to thank current and past McNair Scholars for continuing to demonstrate the power of moral integrity in their academic and personal lives, as they apply the virtues of enthusiasm, loyalty, cooperation, friendship, and industriousness. Since the inception of the program by Dr. Frank Torres in 1999, over 127 students have graduated with either a Master's Degree or Doctorate of Philosophy in programs across the nation.

Dr. Ronald E. McNair

McNair Scholars Symposium Program

Friday, June 2, 2017

Kellogg West Conference Center

Research Symposium—9:30 a.m. to 11:25 a.m.

Schedule of Oral Presentations

Hillside West 1

9:30	Christopher Calle
9:50	Ali Chahine
10:10	Huong Tran
10:30	Jesus Acevedo
10:50	Steven Ochoa
11:10	Erwin Perez

Hillside Central 1

9:30	Luis Rubalcava
9:50	Kimberly Alvarez
10:10	Marysol Gonzalez
10:30	Sergio Maldonado Aguiñiga
10:50	Jessica Saucedo

Hillside West 2

9:30	Brandi Wooten
9:50	Asma Ayyad
10:10	Marisol Torres
10:30	Hector Alarcon
10:50	Elizabeth Marquez
11:10	Matthew Galazzo

Hillside Central 2

9:30	Vincent Moya
9:50	Hsien-Te Kao
10:10	Joshua Palacios
10:30	Tammy Wong
10:50	Brittany Banner

Away Scholars (Non-Presenting)

Veneese Brown	Jordan Garrett
Joseph Gunderson	Jesus Preciado
Daisy Hernandez	Patricia Galvan

Christopher Calle

Mentor: Dr. Yong X. Gan

Title: Tunable Control of Ferrofluidic Jet Instability and Localized Fiber Deposition via a Novel Magnetic-Based Fiber Spinning Technique

Abstract: In electrospinning, typical polymeric solutions undergo two distinct jet motion phases, a stable jet and a whipping instability phase. Due to the electrically-driven instabilities that manifest as a result of the high electric potential gradient applied, ejected jets characteristically exhibit uncontrollable lateral behavior. A proposed alternative to the electrospinning method will be explored in this research, specifically to simplify and reduce the monetary cost of the conventional apparatus setup. In a novel magnetic-based fiber spinning technique, typical electrospun polymeric-based solutions will be doped with iron (III) oxide magnetic nanoparticles for the sole purpose of exploiting the superparamagnetic nature of the embedded magnetite particulates. Instead of exposing this unique class of magnetic fluids to an electrostatic field, an external magnetostatic field will be integrated to prevent the ejected ferrofluidic jet from transitioning into physically unstable conditions by attenuating the undesirable effects caused by electrically-driven instabilities. Commercially available neodymium iron boron (NeFeB) permanent magnets will be used to generate the required magnetic field configuration to orient and elongate the jet along a vertically downwards trajectory. Control of jet motion in this manner suggests not only an improvement in fiber tuning capabilities, however, also the ability to generate a variety of specialized geometric configurations or templates by laterally moving the fiber collecting surface. Consequently, this novel spinning technique offers the ability to localize fiber deposition, a capability currently not possible by the conventional electrospinning method. Such anticipated enhancements to the spinning of ultrathin polymeric-based fibers via magnetostatic fields will serve to improve upon their commercial manufacturability and affordability.

Biography: Christopher Calle is a senior Mechanical Engineering major with a double major in Physics at California State Polytechnic University, Pomona. His primary interest includes the dynamic modeling and control of physical systems with an emphasis in artificially intelligent and autonomous robots. He intends to pursue a Ph.D. in order to be at the forefront of this technically rich and multi-disciplinary field. His current research project focuses on the development of a novel fiber manufacturing technique which seeks to overcome inherent drawbacks to the electrospinning procedure currently in use. This summer he will be participating in the Summer Undergraduate Research Fellowship (SURF) program at Stanford University.

Scholar Abstracts and Biographies

Hillside West #1

Ali Chahine

Mentor: Dr. Frank Chandler

Title: Research Design on Cryogenic Thermal Vacuum Chambers

Abstract: A Thermal Vacuum Chamber is an enclosed chamber which is commonly used for aerospace applications and allows for the testing of miniature satellites. Accordingly, there is a need to improve the performance of miniature satellites and electric propulsion systems which hold promise for future space applications. The objective of this research is to design instruments which will be embedded in a Thermal Vacuum Chamber and be capable of analyzing the performance capabilities of miniature satellites and electric engines. A cryogenic vacuum pump will be selected which will flow through the chamber walls and produce a vacuum of around 10^{-7} *Pascals*. A test stand will also be designed to house the tested appliances and a measurement device to calculate the thrust produced. These testing instruments will measure the performance via fiberglass sensors which will relay the information to a nearby computer. The chamber will also be equipped with viewport flanges, constructed of Corning Type 7056 glass with fused Silica or UV grade synthetic sapphire. These materials will be capable of sustaining its structure under the stress induced by the vacuum.

Biography: Ali Chahine is Senior standing undergraduate student at California State Polytechnic University, Pomona. Majoring in Aerospace Engineering, Ali is expected to graduate by the end of Fall 2017. As a member of UMBRA (Undergraduate Missiles Ballistics and Rocketry Associations) and the FEEP (Field Emission Electric Propulsion System) design teams, he has experience with electrical systems, rocket propulsion, and micro-thrusters. He is currently participating in an AIAA (American Institute of Aeronautics and Astronautics) spacecraft design competition for a manned mars orbital mission. Ali plans to acquire a Ph.D. in Aerospace Engineering in the upcoming years, and has hopes of acquiring a career in space exploration.

Huong Tran

Mentor: Dr. Laila Jallo

Title: A Predictive Approach to Cosmetic Powder Mixing using Surface Energy

Abstract: This work presents a predictive material sparing approach for cosmetic formulation development using dry coating techniques. Surface modification using mechanical dry coating has been shown to enhance the processability of fine powders due to its ability to achieve precise surface coating of nano-silica or other flow-aids, as compared to silica (or flow-aids) addition via conventional blending which is a typical cosmetic powder process. In this study a predictive approach to powder mixing using surface energy is proposed to mix cosmetic powders with different particle sizes and bulk densities. This approach eliminates tedious trial and error. The prediction is validated using two material sparing equipment; a magnetic assisted impaction coater (MAIC) which operates in batch mode and a KOMO Fidibus 21 grinder that operates in continuous mode. The formulations will be characterized for packing enhancement and content uniformity using bulk density and Energy Dispersive X-ray EDX, respectively, to quantify the effectiveness of the mixing.

Biography: Huong Tran is a 4th year Chemical Engineering with a minor in Materials Engineering. Huong immigrated to America in 2010 in order to further my education. During her time at Orange Coast College, her interest of Chemistry and Science had pushed her towards pursuing a bachelor degree at Cal Poly Pomona. Her research interests focus mainly on the behaviors of pharmaceutical and cosmetic powders. She plans to obtain her Ph.D. in Pharmaceutical/Materials Engineering.

Scholar Abstracts and Biographies

Hillside West #1

Jesus Acevedo

Mentor: Dr. Hyoung Soo Kim

Title: Improving the Efficiency of Radio Frequency Filter Designs

Abstract: Radio frequency filters are an important part of much of the technologies we use today. Their advancement in design has allowed us to innovate technology continuously. By conducting this research experiment, I will attempt to expand the abilities of the radio frequency filters to operate in a much more efficient manner that will lead to further innovation in the future. The two main aspects I will be focusing on will be trying to widen the operating frequencies of a filter as well as sharpening the filtering of each signal. Current filter designs specify certain cutoff frequencies which indicate the operating frequencies of any particular filter. However, the designs of these filters contain flaws in the sense that they are allowing fractions of other signals with unwanted frequency values to be filtered through. The passing of these fractional signals act as noise on the output signal of which we wish to analyze. This creates a distortion of the outputted signal which increase the chances for miscommunication between one system to another. This intent for this research is to minimize the amount of distortion by increasing the sharpness of the of filtration at the intended cutoff frequency(s). We will start the process by designing and testing material for the filter, followed by implementing the design on a Printed Circuit Board, and then finally comparing its attributes to a computer software simulation to test for accuracy in our final design. Attempting to achieve this will be difficult because of the multiple factors that play a role in this experiment, but with the right design developing a more efficient filter becomes more realistic.

Biography: Jesus Acevedo is a Junior Electrical Engineering major at Cal Poly Pomona. His research interests include radio frequency filter design, and renewable energy storage. His current research project is on the development of sharper filtration and expansion of operating frequencies in order maximize the efficiency of current radio frequency filter designs for real world applications. Jesus is responsible for designing both a Low Pass Filter and a Band Pass Filter with that resemble the characteristics previously specified. This summer he will be participating in an internship position at Southern California Edison in the Substation Engineering branch. Ultimately, Jesus plans to work with renewable energy in research and developing ways to make the transitions from fossil fuels to completely renewable energy sources. He will be applying to Ph.D. programs in fall 2017.

Steven Ochoa

Mentor: Dr. Vilapanur Ravi

Title: Synthesis and Properties of novel Polymer Matrix Composites

Abstract: Valued for their high specific strength polymers today are in abundant use in many sectors like the automotive and construction industries. Unfortunately, many of these ubiquitous polymers in use are harmful to the environment as they degrade and often take thousands of years to break down. Biodegradable polymers exist but are less used as they are typically weaker than their harmful alternatives. It has been found that certain natural fibers, when added to a biodegradable polymer, or bio-polymer, can be used to enhance the polymer's mechanical properties substantially. This method has been growing in popularity because it produces strong, durable, and completely bio-degradable materials that can be disposed of in an environmentally safe way. Combining different bio-materials to reinforce bio-polymers allows for the selection of specific desired characteristics from each component to improve the resulting overall characteristics of the bio-composite. It is imaginable, with an abundance of natural and biodegradable materials available, that there are infinite possibilities of combinations for bio-composites each with their own particular advantages and characteristic behaviors. In the past decade, this growing field of research has intrigued many scientists searching for promising new bio-composites to replace harmful plastics. There are still many unexplored natural materials that are produced on a large scale everyday as byproducts of agricultural manufacturing that have yet to be tested. There is approximately 6 – 8 million tons of prawn shell waste produced annually on a global scale. Southeast Asia is responsible for about 1.5 million of these tons alone. Yan et al. (14) This is largely because prawn meat only accounts for about 40% of its body weight as compared to 75% meat content in the body of a tuna fish. Prawn shells contain the naturally occurring, non-toxic, biodegradable polymer Chitin. This compound is similar to cellulose and is currently being used in cosmetics, biomedicine, food packaging, pharmaceuticals, and textiles.

Biography: Steven Ochoa is currently a student attending California State Polytechnic University, Pomona. He is pursuing his bachelor's degree in Mechanical Engineering and intends to subsequently earn his masters and doctorate degree in either biomedical or materials engineering. Steven hopes that one day he might be a professor at a university where he will be able to continue his own research, help others with their research, and teach eager students like himself. His research experience has instilled in him a passion for understanding the mechanics of materials and composites. His interests lie in bio-materials, bio-composites, nano-materials and environmentally safe alternatives to ubiquitous materials being used today.

Scholar Abstracts and Biographies

Hillside West #1

Erwin Perez

Mentor: Dr. Subodh Bhandari

Title: Collision Avoidance System for Unmanned Aerial Vehicles using Stereoscopic Vision

Abstract: This project focuses on the use of stereoscopic vision as a means to sensing and detecting obstacles and other aircraft. The application of the autonomous collision avoidance system is specifically designed for small unmanned aerial vehicles (UAVs). The importance of this research has become increasingly more relevant as increased use of UAVs in commercial and private sectors has led to increased FAA regulations. Implementation of collision avoidance systems can help integrate the UAVs in the National Airspace System without safety concerns. Stereoscopic vision provides a cheaper and light weight solution for collision detection. Using two cameras, it is possible to use depth perception to create a depth map that helps with the sensing of the obstacles and their distances. Two Point Grey Chameleon3 cameras with Fujinon lenses are mounted on a DJI S900 Hexacopter UAV to generate the images needed to generate the disparity maps. This process is accomplished with the use of an Intel NUC board for onboard processing. The board communicates with the PixHawk 3DR, which transmits data to the ground control station via XBee radios. The Intel NUC generates a disparity map using an algorithm that uses the OpenCV library to process the images into the map. The algorithm generates the disparity map that will be provided to the collision avoidance algorithm, which will guide the UAV to the location within the map with the least dense area. The image processing algorithm is designed to remove noise in the image data. Disparity map generation using flight test data will be presented and the future direction of the project will be discussed.

Biography: Erwin Perez is a junior aerospace engineering major at the California State Polytechnic University, Pomona. While at Cal Poly Pomona, Erwin has become involved in multiple projects which have further expanded his knowledge in aerospace. Currently, Erwin is working on an autonomous collision avoidance project, by the use of stereoscopic vision, on an autonomous aerial vehicle (UAV). His passion for the project spawns from the rapid growth in the use of UAVs worldwide. Technology such as the one Erwin is implementing on his project will allow for safer UAV operation and will help minimize human error. The applications of his project are broad; stereoscopic vision can be used to more safely operate UAVs in agriculture, photography, private use, search and rescue, disaster relief, and anywhere a safer UAV can be beneficial. Erwin will be conducting further UAV research this summer when he participates in the Unmanned Aerial Systems REU at Cal Poly Pomona. Ultimately, Erwin hopes to work in the aerospace industry while further applying his experience in unmanned aerial systems.

Scholar Abstracts and Biographies
Hillside West #2

Brandi Wooten

Mentor: Dr. Ertan Salik

Title: Investigating and Reducing Noise in Tapered Optical Fibers due to Polarization Changes

Abstract: Biconically tapered optical fibers (BTOF) may be used in detection of target bio-molecules such proteins or DNA. BTOFs can be most advantageous in medical diagnostics due their ability to provide real time results. In our lab, we have demonstrated that BTOFs can determine concentrations of some antibodies (IgG) as low as 50 nanograms/milliliter. The sensor acts as an interferometer and when antibodies bind to the antigens functionalized onto the sensor, it creates a shift in the interference pattern. This shift can then be correlated with the concentration. To improve our limit of detection, we need to decrease the noise in the system as much as possible. We hypothesize that along with ambient temperature fluctuations, the system is dependent upon polarization changes of the light source. The goal is to reduce the noise within the system due to polarization or introduce the proper instruments into the system to negate the effects of polarization changes.

Biography: Brandi Wooten in a physics major at Cal Poly Pomona and conducts research in the bio-photonics lab on campus. Her current research project involves reducing the noise in tapered optical fiber biosensors due to state of polarization changes and utilizing new devices to negate these effects. This summer she will be attending an REU at University of Michigan working with Dr. Heron at the Center of Photonics and Multiscale Nanomaterials. She plans on applying to optics graduate programs in Fall 2018.

Asma Ayyad

Mentor: Dr. Erin Questad

Title: Juglone Concentrations in Soil Underneath the California Black Walnut (*Juglans californica*) Throughout the Growing Season

Abstract: As the drought in California continues and natural landscaping with native species is becoming a preferred choice among gardeners and landscape architects, the search for native drought resistant species is on the rise. One native tree species that has great potential is the Southern California black walnut (*Juglans californica*); however, other *Juglans* species are known to release juglone into the soil and can interfere with the growth of neighboring plants. In order to better understand *J. californica*, a thorough study on the dispersal and effects of juglone in the soil could lead to vital information on how we can better utilize this tree. There has been an extensive amount of research done on *J. californica's* relative the eastern black walnut (*Juglans nigra*), but very little is known on our own native. In this study, we determine the soil conditions underneath *J. californica*, how these soil conditions could affect nearby plants, and how these conditions change during the growing seasons. The soil conditions measured in this study includes soil moisture, soil temperature, and juglone concentrations. Soil samples will be analyzed for juglone concentrations through high-pressure liquid chromatography (HPLC). With a better understanding on the soil conditions beneath *J. californica*, we can discover which species of plants are unaffected by the juglone produced by the tree and possibly begin to use this tree in landscaping and native plant restoration.

Biography: Asma Ayyad is a graduating Biotechnology major with a minor in Chemistry at California State Polytechnic University, Pomona. Her research interests include interspecific competition, invasive species, and anthropogenic impact, as well as deepening her knowledge of ecology and conservation in general. Her current research project is on the quantification of juglone in the soil underneath the California black walnut to get a better understanding of the microclimate conditions of the soil in hopes of using this tree in landscaping and native plant restoration. This following year, she will be attending University of California, Riverside to complete a doctoral program in plant biology. Asma aims to one-day work in research to better understand the natural world, develop ways to improve the current state of the environment, and learn more on the complex interactions of life that shape the world as we know it.

Scholar Abstracts and Biographies

Hillside West #2

Marisol Torres

Mentor: Dr. Joan Leong

Title: Analyzing Morphology Variation Among Honey Bee (*Apis mellifera)* Individuals with Different Foraging Behaviors on Watermelon Flowers (*Citrullus lanatus)*

Abstract: Adult honeybees spend their last few weeks of their life span foraging on flowers for pollen or nectar. Bees typically begin to forage until they are at least 21 days old. A typical bee's foraging behavior is a single visit per flower, however there have been field observations of honey bees visiting an individual flower more than once during a brief period of time (revisitation). My study asks if there are morphological differences between these two different behavioral patterns that honeybees perform on watermelon flowers. I will compare the morphological feature of wing wear between the two groups of honey bee foragers: the "single visit" foragers and the "revisitation" foragers. As wing wear is an important predictor of age in adult insects, I will be able to determine if revisitation behavior is related to the age of the foraging bee. I will score the amount of wing wear the honeybees forewings have and take measurements of the head width. The purpose of this experiment is to distinguish if there are wing wear differences between the two groups of honeybees. I predict there will be wing wear differences between the two groups; for revisitation forager group to have more wing wear. This would allow me to distinguish between the revisitation bees from single visit bees not just behavioral differences but by morphological differences.

Biography: Marisol Torres is a transfer student from Barstow Community College and currently a Junior General Biology major at California State Polytechnic University, Pomona. Her research interests are in biodiversity and conservation ecology. Her current research project is on analyzing honey bees to find if there are any morphological differences between honey bees that are a single visit versus a revisitation behavior that is being performed on watermelon flowers. Marisol is responsible for mounting wings onto a slide, scoring wing damage, and taking body measurements of the honeybees. This summer she will be participating in summer research with Dr. Leong at Cal Poly Pomona. Ultimately, Marisol wants to earn her Ph.D. in Ecology and perform research in biodiversity.

Scholar Abstracts and Biographies

Hillside West #2

Hector Alarcon

Mentor: Dr. Chantal Stieber

Title: Deoxydehydration of Biomass-Derived Carbohydrates to Olefins using Molecular Vanadium Catalysts

Abstract: Future risk of fossil fuel depletion and documented climate change serve as incentives for studying alternative and sustainable sources of energy and chemical feedstock. Biomass from dry plant matter is the most abundant raw material on earth and is currently industrially underutilized. By removing oxygen from biomass, chemical feedstock could be generated that would otherwise be obtained from fossil fuels through cracking. This work aims to improve the conversion of vicinal diols to alkenes with new vanadium catalysts. New vanadium complexes were synthesized using two different bidentate N-heterocyclic carbene ligands. Results were compared to previous reports by establishing reproducibility for reported reactions with commercially available vanadium salts prior to testing new vanadium catalysts. Successfully improving the conversion of 1,2 cyclohexanediol could be useful in a transition to larger scale DODH conversion of glycols to useful hydrocarbons.

Biography: Hector Alarcon is a senior biology major at California Polytechnic University, Pomona. His research interests include, chemistry and oral biology. His current project involves the conversion of biomass- derived carbohydrates to useful olefins through deoxydehydration(DODH) using earth abundant molecular catalysts. Hector is working towards becoming an oral surgeon and will be applying to a dual Oral Maxillofacial science Phd., D.D.S. program in the summer of 2017.

Elizabeth Marquez

Mentor: Dr. Nancy Buckley

Title: Effects of THC on the severity of *Candida albicans* Vulvovaginal Candidiasis

Abstract: Marijuana and other cannabinoids have been seen to alter immunomodulatory response both *in vitro* and in animal models. Delta-9- tetrahydrocannabinol (THC), the main psychoactive component in marijuana, has been reported to decrease resistance to bacterial, protozoan, and viral infections. However, little is known of the effects of THC on fungal infections. In our laboratory, it was recently found that chronic THC decreases mouse survival to a secondary systemic *C. albicans* infection while increases tissue fungal load and decreasing cytokine production. Vulvovaginal candidiasis (VVC) is a vaginal opportunistic fungal infection caused by *Candida* species. Over 75% of women experience VVC, commonly known as vaginal yeast infection, at least once in their life. Because approximately 15% will suffer from chronic VVC requiring medical treatment, it is important to continue to broaden our understanding of VVC. The aim of our studies is to determine the effects of chronic THC on *Candida albicans (C. albicans)* induced VVC in mice. However, we first established the VVC model. Mice were injected with Depo-Provera (2.7mg/mouse, s.c.) to facilitate the uptake of C. albicans infection on days 1 and 7. On day 5, some mice were immunosuppressed with 5-fluorouracil (5-F), a chemotherapeutic agent. The mice were then intravaginally infected with 10 µl of *C. albicans* (1x10 7 yeast cells/ mouse) on day 8. Four days' post *C. albicans* infection (day 12), tissues were collected to evaluate fungal load and cytokine production. We found that mouse weight for immune competent and immune suppressed mice equally decreased over the course of the 12 days of the study. Mice immune suppressed with 5-F, exhibited a lower uterine/vagina fungal load compared to that of immune competent mice. However, kidney fungal load was higher in 5-F treated mice compared to controls. In addition, serum IL-12p40 levels were lower in 5-F treated mice compared to control mice. Furthermore, the presence of yeast colonies in blood clot indicated that the VVC became a systemic infection. Thus, we have developed a model with which to investigate the effects of THC on VVC. We expect THC to increase the severity of VVC.

Biography: Elizabeth Marquez is currently studying the Biological Sciences with an interdisciplinary minor in Physiology. She is the proud daughter of two Mexican immigrants who migrated to the United States to give her and her three siblings the best opportunity they could to succeed. Elizabeth is strong, proud, hardworking, and wise. She is actively involved on campus and within the community promoting diversity and higher education throughout local underprivileged communities. Her academic interests include immunology, public health, and medicine. She will be graduating with a Bachelor of Science in the spring of 2018. She will then move on to attend professional school to become a Physicians Assistant. She looks forward to working in Primary Care within low income communities.

Scholar Abstracts and Biographies

Hillside West #2

Matthew Galazzo

Mentor: Dr. Floyd Klavetter

Title: Mechanistic Study of the Ring Opening Metathesis Polymerization of Cyclooctene

Abstract: Abstract: Ring Opening Metathesis Polymerization (ROMP) has become a useful tool for synthetic, organic, and polymer chemists. Large scale use of ROMP is only recently being exploited in the petrochemical industry with the creation of polynorbornene, polydicyclopentadiene, and polyoctanemer with expected growth in the fine chemical industry. Use of ROMP is limited, however, by its nature. It requires high dilution and sensitive catalysts and yields poor selectivity and separation of products. A better mechanistic understanding of this underutilized polymerization reaction can lead to further implementation in industry. ROMP involves polymer formation through the reaction between a metal-carbene and a cyclic diene. The metal-carbene attacks the double bond of the alkene forming a metallocyclobutane intermediate. Because of ring strain, the metallocyclobutane bonds cleave to form a linear metallic diene, allowing further reactions with the cyclic diene monomer. The metallic diene may also react with itself, forming a larger cyclic diene and regenerating the metal-carbene. Using Grubb's first generation catalyst, mechanistic studies of Ring Opening Metathesis Polymerization of cyclooctene in toluene were conducted. The effects of temperature, catalyst loading, and monomer concentration on product selectivity are of particular interest. Moreover, we seek to understand the effects of coordinating solvents on the formation of products. Dimer, trimer, and oligomer distribution are to be analyzed through Gas Chromatography -Mass Spectroscopy. It is expected that dimer formation will decrease with increased catalyst loadings, monomer concentration, and temperature. Coordinating solvents should play an inhibitory role in the reaction and slow it down, thereby increasing dimer yield.

Biography: Matthew Galazzo is a Senior Chemical Engineering major with minors in Materials Engineering and French at Cal Poly Pomona. His research interests include materials synthesis, electrochemical materials, and polymers. Matthew's previous research experience includes producing magnesium-oxide nanofibers through a reactive electrospinning process and an NSF-REU involving the polymerization of lignin. His current research project investigates the mechanism of the Ring Opening Metathesis Polymerization of cyclooctene with special attention to the roles of temperature and coordinating solvents. He is currently awaiting graduate school decisions. Ultimately, Matthew hopes to continue his research career by working on energy related projects at a national laboratory.

Luis Rubalcava

Mentor: Dr. Alvaro Huerta and Dr. Abhishek Tiwari

Title: Identifying Spatial Mismatch; A Study of the Coachella Valley

Abstract: The Coachella Valley is a region of many inequities. Environmental justice issues have been a concern for the Coachella Valley in recent years with the increase in the national income gap and the social disparities associated with it. Local, county and regional transportation planning efforts have tended to focus resources in the wealthier, established communities, but individuals have been pushed further and further out into areas with poor transport connectivity and poor service provisions. A mismatch between the location of affordable housing and the location of low-wage jobs means that lower-income people must commute far distances for work, further limiting their ability to retain employment. The more that workers are displaced; the lesser the chances of overcoming the spatial mismatch. Areas with lower transportation provisions lead to higher poverty rates, lower employment, and lower educational attainment. As this distance increases, low-skill workers with low levels of personal mobility are not able to meet the travel requirements of the dispersed locations (Sanchez, 1998). According to researcher Kilian Heilmann, mass transit for commuting in most American cities is largely used by low-income people that are unable to afford a car, further highlighting the need for increased mobility in transport poor regions. This study will use Geographical Information Systems (GIS), regression, and descriptive statistics to analyze how location affects the demographics of individuals with varying levels of transportation capacity. With the help of the GIS software and census tract information, spatial and demographic variables will be used to identify the occurrence of spatial mismatch by tracking the readily available secondary data of the Coachella Valley through a temporal study. There has been very little research on the topic of public transportation equity in the Coachella Valley region, and this study will explore the poverty rate of areas that have poor transportation service provisions. The purpose of this study is to increase the knowledge and shed some light on any potential spatial mismatch occurring in the Coachella Valley.

Biography: Luis Rubalcava is a student at California State Polytechnic University, Pomona majoring in Urban and Regional Planning and minoring in Geographic Information Systems. He has previously attended College of the Desert community college in Palm Desert, CA, earning an Associate's degree in Architecture. His research interests include the study of transportation, more specifically on the integration of transportation with land use to help minimize the reliance on automobiles; and social justice involved with transportation and poverty. His current research involves the identification of spatial mismatch to further understand the transportation related barriers to opportunity access in the Coachella and surrounding regions. Luis will be participating in a Geographical Studies REU this summer at Michigan State University. Ultimately, Luis plans to be able to go back to his community in Coachella to try and promote equitable transportation planning.

Scholar Abstracts and Biographies

Hillside Central #1

Kimberly Alvarez

Mentor: Dr. Jose Aguilar-Hernandez

Title: Parental Inclusivity within Higher Education Institutions: Support Services at California State University Polytechnic Pomona

Abstract: In 2012 undergraduate parents comprised 32% of all undergraduate college students across America, mothers of color held the majority of higher percentages reflecting a considerable attendance within higher education institutions, according to Dr. Gault's (et al.) 4.8 Million College Students Are Raising Children (2014). Unfortunately, many student parents face an individuality that is often marginalized by many college campus communities. Higher education student support services are meant to assist all students achieve academic success. However, the needs of undergraduate parents are not being adequately met with regards to academic support. Due to insufficient programing within support resources for undergraduate parents, I have chosen to focus my qualitative study on areas to improve inclusivity within our campus community at California State Polytechnic University of Pomona. The goal of my research is to advocate for the inclusivity of undergraduate student parents, more specifically undergraduate mothers of color, within student support resources. The emphasis of my study is to promote the support of undergraduate mothers of color because of the marginalized lived experiences of their intersectionality both in greater society and at a college campus setting. My research highlights the need for a holistic approach to improve representation and deliver adequate academic support services for undergraduate mothers of color. The purpose of my study is to allow a platform for undergraduate student mothers of color to express their needs from student support services, to ensure their inclusivity and by extension improved efficiency in assisting students achieve academic success throughout their campus community. My research is important because, while there are many published works dedicated to advocacy and representation for mothers within higher education, there exists a gap of knowledge with regards to the intersectionality, support, and retention for mothers of color as undergraduate students. While there is opportunity for inclusivity within higher education student services across California State University institutions, my research will shed light on the experiences of current undergraduate student mothers of color attending CPP which are further under represented through published scholarly works.

Biography: Growing up in Echo Park with four siblings and a large extended family, Kimberly dreamt of making her family proud by becoming the first graduate of higher education. As an undergraduate parent of two, she has encountered many educational barriers which she has had to combat to prove resilient. Kimberly Denise Alvarez is presently completing her Bachelors of Arts degree in Gender, Ethnic, and Multicultural Studies. She has recently accepted an invitation to Oregon State University where she will start her College Student Services Administration graduate program in the fall. Her research interests include social justice, diversity, and sustainability. In the future she plans to publish literature for the support of parental inclusivity within higher education institutions. In addition, she is motivated to pursue her doctorate, to apply her knowledge of skills and theories to the reform of student resource policies for the acceptance of student parents and guardians.

Marysol Gonzalez

Mentor: Dr. Alejandro Morales

Title: The Dynamics of Sexuality and Slut-Shaming Discourse Among Latina College Students

Abstract: In 2011, a Toronto police officer at York University ignited substantial controversy and made national headlines when he expressed that women should not dress provocatively, more specifically like sluts, if they do not want to become victims of sexual violence, (Reger, 2014). This incident is only one example of the utilization of slut-shaming to continuously dominate women and reinforce the sexual disparities that exist among women and men; where women vastly suffer from these inequalities (Armstrong, Hamilton, Armstrong, Seeley, 2014). Slut-shaming is depicted as an expression of discourse used in the degradation of an individual, usually female, which suggests an image of impurity and shame when sexual nature is identified or perceived, (Pickel, Gentry, 2016). Moreover, not only is slut-shaming instrumental in the unremitting female oppression reinforced by patriarchy, but women also succumb to this subjugation and contribute shame and guilt causing detrimental perceptions of themselves and of other women, (Armstrong, Hamilton, Armstrong, Seeley, 2014). The purpose of this study is to explore the concept of slut-shaming discourse and the overall female sexual experience by analyzing their impact on perceptions of self-image and in formulating insights of others focusing on the perspectives of young Latina women. The preliminary results that have been analyzed explicate that these notions about slut-shaming are learned at a young age among participants, the family dynamic has significant influence in reinforcing the concepts about slut-shaming and in defining a slut, and participants strongly believe that men do not experience slut-shaming as women do, if at all.

Biography: Marysol Gonzalez is a Senior majoring in Psychology with a Women's Studies minor at Cal Poly Pomona. She is a first-generation student and will be the first in her family to graduate with a Bachelor's degree next quarter. As a Chicana feminist, Marysol is a strong advocate for empowering women and the multicultural community. Her research interests include analyzing issues prominent within Chicana feminism and other perspectives inclusive of the overall female experience. Her current research examines the societal and cultural implications that construct a Latina's identity. She focuses her analysis on slut-shaming discourse and how the beliefs, values, and cultural upbringings of a Latina/o background influence the conceptualization of identity among Latinas. Marysol strives to contribute research to literature on slut-shaming and female sexuality, particularly from a multicultural perspective. After graduating this upcoming Fall quarter, she plans to begin her graduate studies towards a doctoral degree in Clinical Psychology.

Scholar Abstracts and Biographies

Hillside Central #1

Sergio Maldonado Aguiñiga

Mentor: Dr. Alejandro Morales

Title: Strengths Possessed by Latino Adults that Facilitate the Desistance from Gangs

Abstract: Research in gang desistance had been ignored by researchers in psychology. Although researchers have started examining the desistance process, all studies have been looking from a deficiency perspective and ignoring the strengths that may help them leave the gang. Desistance in this study is defined as the final and permanent cessation of all offenses and gang related-criminal activities. The purpose of this exploratory qualitative study is to identify the strengths of former Latino male gang members that facilitated their desistance from gang membership. Three questions we will be investigating are: 1) What are the specific strengths that promote desistance; 2) How did the strengths assist in desistance; and 3) Which strengths helped participants stay desisted? Participants will include five (N=5) male Latino adults between the ages of 18-60 who are former gang members from a Southern Californian gang for a minimum of six months. Participants will be interviewed in regards what helped them leave the gang. Upon completion of the interviews, the principal investigator will transcribe the interviews and begin coding responses through thematic analyses analyzing the data with Value in Action Classification (VIA-Classification). The goal is to illuminate what specific strengths facilitate gang desistance and how to develop programs that are more strength based for Latino males.

Biography: Sergio Maldonado Aguiñiga is a second-year transfer student from Moreno Valley College majoring in Psychology with a minor in Political Science at California State Polytechnic University, Pomona. While volunteering with the Prison Education Project and Reintegration Academy, he developed interests in integrating character strengths approaches in counseling practices for youth offenders and former and current incarcerated individuals. His current research project entails identifying character strengths on former gang members which might have facilitated the cessation of all gang and criminal activity. He aspires to be a tenure track professor at a land grant university and licensed counselor to develop prevention and intervention character strengths based programs while volunteering with non-profit organizations aiming at reducing recidivism rate. This summer he will be conducting research at University of Nebraska-Lincoln examining the interplay between ecological stress (e.g., discrimination, economic hardship) and proximal (e.g., family/peer/work) and structural (e.g., cultural, social) influences and how they shape the behavioral and physical health of Mexican-origin youth. He will be applying for Ph.D. programs in Counseling Psychology in Spring 2018.

Jessica Saucedo

Mentor: Dr. Sara Langford

Title: The Development of the Passion for Teaching Scale

Abstract: The purpose of the project is to create a scale that measures an individual's passion for the teaching professions. Current literature focuses on measuring general passion, entrepreneurial passion, and passion for work. These are general scales, which may not be most accurate when applied to work, specifically teaching. The creation of this scale will allow educational researchers to optimally understand passion in teaching. An adaptation of the general passion scale has been developed to address teaching, as well as by adapting criteria from an Excellence in Teaching Award. In addition, interviews were conducted with a sample of eight professors who received Excellence in Teaching Awards at Cal Poly Pomona. The content-analyzed interviews will assist in developing new scale items, in addition to the adapted general passion scale. Using the adapted scale and the new scale items, an updated scale will be created and administered to a large group of general faculty from Cal Poly Pomona using strategic sampling. An item analysis of participants' responses will be conducted to discard or revise inadequate items. Correlations between participant responses will be examined. This scale will be beneficial for educators, employers in educational contexts, and more generally for anyone engaged in the scholarship of teaching.

Biography: Jessica is a third year psychology major at Cal Poly Pomona. She aspires to be a psychological researcher and to understand social interactions in great depth. Her goal is to become a tenured professor in a land grant university where she can conduct research and teach the next generations of scholars and professionals in psychology. She is particularly interested in issues centered in social psychology and environmental psychology, specifically in social perception, social influence, and environmental stress. Ultimately, Jessica would like to use her background in social psychology and environmental psychology to improve work place environments, as well as to discover how companies and organizations can be persuaded to become more sustainable and environmentally friendly. This summer, she will be continuing her research at Cal Poly Pomona, and will be applying to Ph.D. programs in fall 2017.

Vincent Moya

Mentor: Dr. Stacy Musgrave

Title: Structure Sense

Abstract: Common Core Mathematical Practice 7 states that one goal for students is to learn how to look for and make use of structure in their mathematical activity. In order to support students in reasoning in this way, teachers must be able to engage in structural reasoning themselves. Thus, this research investigates the mathematical reasoning of undergraduates who are enrolled in courses for developing content competency for K-12 mathematics teaching. These potential future teachers completed a 10-minute questionnaire consisting of two mathematical tasks. Their responses were analyzed and categorized to highlight various ways of reasoning. We will invite 3-6 students whose responses suggest different ways of thinking to participate in semi-structured clinical interviews so that we can further probe their thinking. The collection of written and interview data will be analyzed for common themes and for distinct reasoning in order to better understand what triggers an individual to rely on structural reasoning versus non-structural reasoning problem solving strategies.

Biography: Vincent Moya is a chemical engineering student with a minor in mathematics. He began his college career in the Fall of 2013. During the beginning of his junior year, he began to conduct research in pharmaceutical engineering under Dr. Jallo. After which, he went to a REU at Northwestern University to work on microfluidic cells. When he returned from his REU, he began to conduct research in Math Education under Dr. Musgrave. He placed in second place at the RSCA and went to San Luis Obispo to represent Cal Poly Pomona at the CSU Research Conference. He is in the process of submitting a research paper for publication. He plans to continue conducting research in the field of Math Education as a graduate student. His career goals are to teach mathematics at a community college or cal state university while working in the pharmaceutical industry.

Hsien-Te Kao

Mentor: Dr. Jennifer Switkes

Title: Branch Davidians Containment Simulation

Abstract: The Branch Davidians was an active radical religious sect under the leadership of David Koresh at the Mount Carmel Center in Waco, Texas from 1987 to 1993. The ATF raided the center on February 28, 1993 under the suspicion of weapon violations, and an intense gun battle erupted resulting in the deaths of four government agents and six Branch Davidians. The FBI joined in the operation after 51 days of standoff and called for Waco siege. The Branch Davidians ignited their center during the siege, and 76 members were killed on April 19, 1993. The Waco siege marked the end of the Branch Davidians with the total of 86 deaths. The state and federal government decided to aggressively dismantle the Branch Davidians through raid and siege that caused massive deaths. The government decision on containment is critical to minimize the potential death and injury. We are interested in the effect of nonviolent containment methods on the Branch Davidians. We create a computer simulation space that replicates similar geographic location of Waco city, population demographics of Waco city residents and Branch Davidians and the social interaction in the population using agent-based modeling. We investigate the impact of four containment methods, recruitment intervention, government assistance, Waco city stress management, and Branch Davidians crime regulation, using the simulation space and establish a comparison analysis using the collected data sets. We discover recruitment intervention is the most effective nonviolent containment that significantly reduces the Branch Davidians membership in four years and has a higher potential to prevent Waco siege.

Biography: Hsien-Te Kao is a fourth year Mathematics major with a minor in Women's Studies at Cal Poly Pomona. His interdisciplinary background in mathematics and behavioral sciences has flourished his unique perspective on predictable human behavior. His research interest is computational social sciences, specializing in collective irrational behavior. His research project advises the government which containment methods to executive on the Branch Davidians to minimize the potential death and injury by preventing raid and siege. He will be attending the Computer Sciences PhD program at University of Southern California this fall. Hsien-Te is an influential and passionate researcher that inspires other young scholars with his curiosity and creativity in research.

Joshua Palacios

Mentor: Dr. Marc Scarcelli

Title: Informal Land Rights: Why Has Formalization Worked in Some Countries, but Not Others?

Abstract: In the effort to fight poverty across Less Developed Countries (LDCs), there have been political, economic, and social movements towards reshaping institutions to reach prosperity. Recently, the United Nations Economic Commission for Europe, The United Nations Development Program (UNDP), USAID, and a variety of other leading organizations have published program proposals, policy proposals, and papers to increase formalization of land rights in order to have greater results in development. Formalization is the process in which informal institutions, in particular, informal land ownership becomes a formal institution and is recognized by the state. However, while the political left and right have praised these policies, implementation has gained mixed results. This paper seeks to answer a simple question; why has the policy of land formalization found success in some states, but not others? This paper seeks to find resolution between the ideas that Hernardo de Soto proposed in his landmark piece, Mystery of Capital. While there is little contention between policy makers on formalization, there is debate between scholars on whether formalization actually creates more prosperity for the most vulnerable groups. This paper uses three case studies to understand if formalization, as a theory, is inherently flawed, or if policy implementation has led to mixed results.

Biography: Joshua Palacios is a Political Science major with a minor in Multicultural Leadership Studies at Cal Poly Pomona. His research interests include comparative politics, land rights, economic and political development, the informal economy, and human rights. His research project is a comparative study in which takes three case studies and examines their land formalization programs while determining the effects on the people, the economy, and the state. Initial interest came to this topic as land tenureship is not only an economic issue, but a human right one that effects millions of people every day. After graduation he is leaving for The Republic of Macedonia to become a Community Youth Development Volunteer for the Peace Corps where he will learn the first-hand experience of development. Joshua will be applying to Ph.D. programs when his service is coming to an end, then wishes to work for the United Nations Development Program.

Tammy Wong

Mentor: Dr. Kahena Viale

Title: How Rape Culture Affects the Way Rape Cases are Treated

Abstract: Rape culture exists when sexual violence against women is normalized and excused in society. Sexual violence still plagues our modern society and our new laws do not work efficiently to address this issue or try to eliminate it. Consequently, rape cases are treated unjustly because police officers and jurors frequently take irrelevant circumstances into consideration when analyzing rape cases. This trivialization of rape is a disservice to rape survivors. These judgments are influenced by the following factors: appearance of victim, the alcohol consumption of the victim and the predator, (Vrij and Firmin 2001). Statistics demonstrate that the victims wearing a short skirt in contrast to a long skirt receive more negative reactions (Workman and Freeburg 1999). This also occurs when both the victim and predator were drinking (Norris and Cubbins 1992). Consequently, these societal attitudes sympathize with the rapists, passively condoning their actions while partially blaming the victim. According to the scientific journal, Addictive Behaviors, the increase of alcohol consumption will increase sexual violence along with domestic violence. Researchers concluded that the usage of marijuana has no connection to violent behavior. According to the Rape, Abuse and Incest National Network (RAINN), only 344 out of every 1,000 sexual assaults are reported to police. The purpose of this meta-review study will be to reveal the association between rape culture and the prevalence of rape incidents on college campuses to indicate the need for policy measures that reshape our attitudes toward rape victims. This research project enabled me to apply gender communication theories with practice while peer mentoring students at the Women's Resource Center on campus, and as a result, I contributed positive changes to the diverse college community.

Biography: Tammy Wong is a student at Cal Poly Pomona majoring in Communications with a minor in Women's Studies. Her research interests include intercultural and gender communications. Her current research project is on revealing the association between rape culture and the prevalence of rape incidents on college campuses to indicate the need for policy measures that reshape our attitudes toward rape victims. This fall, she will begin her Master's Degree in Communications at Cal State LA.

Scholar Abstracts and Biographies

Hillside Central #2

Brittany Banner

Mentor: Dr. Mario Guerrero

Title: The Underrepresentation of Women in Politics

Abstract: Representation in political affairs serves as a stepping -stone for political freedom and political injustice. Due to societal norms women are not fully embraced in the world of politics. The importance of women being in politics lies in their representation, if only a certain amount of women are able to participate in a male dominated field; their freedom of representation only exists, but it doesn't make them powerful. If women are allowed to be more active any form of government, which is essential to building and sustaining democracy, the government can exceed its normal capacity. Women serve as over fifty percent of the world's population, yet women are still being under-represented as voters, leaders, and elected officials. The political aspect of life within our democracy cannot be exceeded their capacity if half of the population remains underrepresented. The gender gap in our political system relies on affective preferences or descriptive representation. Women are not openly embraced in the political world, in reference to conservative political views that deter women's participation in political affairs. However, without the presence of women in political offices, gender preferences cannot be exemplified or measured. The pressure of ideologies and political parties dictates political preference in voter's choice. Examining the theory of how women in political offices can enhance women's political engagement. Attempting to correlate the role of political parties and their impact on citizen preferences. The goal of this research is to explain the influence of gender and representation in politics to reveal the flaws within our democracy.

Biography: Brittany Banner is a student at Cal Poly Pomona majoring in Political Science. Currently a McNair Scholar pursing research about the women in politics. Her interest includes various subjects including International Relations (with a focus on Central America), and American Political Institutions. She plans to obtain her Ph.D. in American Politics and become a lawyer.

Scholar Abstracts and Biographies

Away Scholar

Veneese Brown

Mentor: Dr. Jamie Snyder

Title: Sulfolobus Turreted Icosahedral Virus Genome Excision from Sulfolobus Acidocaldarius

Abstract: It is probably a biological constant that viruses are found associated with all known life and that they play an essential role in the ecology and evolution of all life forms. Lytic viruses have now been discovered that infect organisms from each of the three domains of life. Recently, a new lysis system has been described for two archaeal viruses. This lysis system appears to be novel and distinct from previously described virus-encoded lysis systems. One of those viruses, STIV, infects the hyperthermophilic acidophile Sulfolobus species. We recently discovered that this species has a copy of the STIV genome integrated into its chromosome. An integrated form of STIV had never been detected prior to this discovery. This project focuses on trying to excise the viral genome from the host chromosome. By doing so, we hope to learn more about the replication cycle of this unique virus.

Biography: Veneese Brown is a 3rd year Microbiology major at Cal Poly Pomona. Her academic and research interests involve viruses and epidemiology specific topics. Her current research project is on the various methods used to extract STIV from Sulfolobus acidocaldarius. This summer Veneese is participating in the MHIRT summer research program in Taiwan along with only four other students. Her long-term goal is to receive a PhD in Epidemiology and work for the Center of Disease Control and Prevention (CDC). This summer Veneese is participating in the MHIRT undergraduate research program at Kaohsiung Medical University in Taiwan. This is the reason why she is currently absent from the McNair Symposium.

Scholar Abstracts and Biographies

Away Scholar

Joseph Gunderson

Mentor: Dr. Daisy Tang

Title: Demonstration of Peer-to- Peer Human-Robot Teaming Under Sliding Autonomy

Abstract: From autonomous automotives to advertising, society is transitioning into a world where Artificial Intelligence is becoming an increasingly more integrated component of humanity. Traditionally, humans always act like supervisors to give commands to robots. In this research, we will focus on humans and robots working collaboratively as peers. This research will demonstrate the inclusion of peer-to- peer interaction under sliding autonomy of control for applications that require tight collaboration among agents. While multiple robots are attempting to complete a task, inevitably problems will arise. How those problems are communicated to a human coworker and how problems are solved via human intervention will require multiple degrees of autonomy. The purpose of this study will be to show that varying levels of sliding autonomy will allow a dynamic balance of fully autonomous robots and human involvement resulting in the completion of tasks in the most efficient manner. The goal of this research is to fully employ the sliding autonomy approach on a physical application, which will involve physical experiments using 5 tiers of sliding autonomy. In order to validate our approach, we will perform experiments in a box pushing scenario using multiple robots. The task will begin with the robots attempting to complete the task independent of human intervention in a pure autonomous mode. The robot's laser range finder will detect the box and its camera will be used to detect the goal location for the box to be pushed. If a failure is detected, the robots will first attempt to solve the problem itself, if it cannot, the robot will notify the human operator and the human operator will decide which level of sliding autonomy to perform. After the issue is resolved, the robots will return to full autonomy. Based on previous work it is very likely time completion of tasks will increase as human user workload decreases but efficiency of problem solving error detections will decrease. Likewise, peer-to-peer cooperation should result in highest efficiency of problem solving failures but requires full human operator attention and therefore will yield longer task completion time. If levels of autonomy are dynamic though, then task completion should be at its most optimal.

Biography: Joseph Gunderson is currently pursuing a degree in Computer Science at California Polytechnic State University in Pomona. He transferred from Harold Washington College in Chicago, Illinois with an Associate Degree of Science focusing on Mathematics and a 4.0 grade point average. In Joseph's first year at Cal Poly Pomona (CPP), he was the Director of Digital Forensics in the Forensic and Security Technology (FAST) student organization as well as a member of the McNair Scholars Preparatory Program. It was his time spent as a McNair Prep student that would change his academic focus and career goals forever. Joseph immersed himself in research as an official McNair Scholar during his second year at CPP. This effort did not go unnoticed, as Joseph will be doing research in Machine Learning and Artificial Intelligence for Intelligent Tutoring Systems at University of Southern California's summer REU.

Scholar Abstracts and Biographies

Away Scholar

Daisy Hernandez

Mentor: Dr. Edward Bobich

Title: Effects of the Allelopathic Compound Juglone on the Germination and Seedling Success of *Eriogonum fasciculatum, Frangula californica, Rhamnus ilicifolia, Salsola tragus, and Salvia mellifera*

Abstract: The allelopathic effects of juglone on native and non-native plant species is being studied to determine which species can live in close proximity to the California endemic tree Juglans californica (Southern California black walnut). It was believed that the native evergreen shrubs *E. fasciculatum, Frangula californica, Rhamnus ilicifolia,* and *Salvia mellifera* will all be resistant to juglone because they evolved in close proximity to walnuts, whereas S. tragus should not germinate well in the presence of juglone because it is invasive. To this point, the conditions for optimal seed germination for seeds of Eriogonum fasciculatum, Salsola tragus, and Salvia mellifera have been determined. Only the seeds of E. fasciculatum were treated with varying juglone concentrations. The germination was monitored daily and the seeds' radicle and stem lengths were measured once a week.

Biography: Daisy Hernandez is a Junior Environmental Biology major with an emphasis in Microbiology and Biotechnology at Cal Poly Pomona. Her research interests include ecology, plant microbiology, and sustainability. Her current research project is on the allelopathic effects of juglone on California native plant species. This summer, she will be at RiSE at Rutgers conducting research involving the biodegradation of industrial contaminants at a superfund site. Daisy will be applying to Ph.D. programs in Fall 2017. Her ultimate plans are to work in a research lab to explore the field of microbiology and plant biology.

Scholar Abstracts and Biographies

Away Scholar

Jordan Garrett

Mentor: Dr. Robert Blumenfeld

Title: Examining the Functional Network Structure of the Frontal Lobes across Domains of Cognition

Abstract: The frontal lobes implement control operations fundamental to flexible, goal-driven behavior. In the human, at least 19 cytoarchitectonically unique subregions comprise the frontal lobes, and a major aim of cognitive neuroscience has been to characterize the functional organization of these subregions. The aim of the present study was to investigate the topology of frontal lobes by examining patterns of co-activation amongst frontal subregions across a large number of studies in the neuroimaging literature. Using the BrainMap database, which contains activation foci from a large (>1600) set of studies in the neuroimaging literature, I derived meta-analytic co-activation matrices of the frontal lobes for the several specific cognitive domains (Memory, Attention, Working Memory, Language, Audition, Emotion, Vision). After converting these matrices into networks, I used metrics of graph theory to determine their characteristics. My initial results show several specific ways in which the functional wiring of frontal subregions varied according to behavioral domain. First, regions of the frontal lobes are exhibiting both stability and flexibility in their roles across varying domains. Second, the modular structure of these networks varied considerably. Third, the anatomical location of some, but not all, central hub nodes varied with cognitive domain. Some of these nodes also exhibited specialization according to domain. Lastly, a rostrocaudal gradient was detected using a method similar to effective connectivity. Within this gradient is a hierarchal organization of the frontal lobes, with rostral regions ranking above more caudal regions. In general, my initial results lend further credence to the notion that the frontal lobes as a whole, support domain-general control processing, however its functional wiring is highly adaptable and potentially allows different network configurations to support specialized domain-specific processes.

Biography: Jordan Garrett is a third year undergraduate Psychology student. He is also minoring in Chemistry. Jordan aspires to obtain a doctorate degree in the field of Neuroscience, and then become a university professor. His hobbies include hiking, reading, playing sports, and singing. His favorite sports is baseball and basketball. He hopes to one day be able to combine his love for athletics and Neuroscience by working with professional athletes to improve performance. In addition, he has a strong love for superheroes, especially Deadpool. Jordan's utmost unrealistic goal is to be able to create super-humans through demystification of the brain and boosting its processes. Lastly, Jordan will one day go wing suit flying as well as domesticate a wild wolf. Jordan's role models and influencers include his father, mother, siblings, grandparents and Kevin Hart. Jordan will be conducting research at NYU in the center of neural science in Dr. Wendy Suzuki's lab under Dr. Julia Basso.

Jesus Preciado

Mentor: Dr. Bharti Sharma

Title: Virus-Induced Gene Silencing - A Reverse Genetics Approach to Study Gene Function in Columbines

Abstract: Virus-induced gene silencing is a reverse genetics technique to transiently knock down gene function. This technique involves the introduction of a virus based construct that contains a fragment of candidate gene of interest, which is endogenously expressed in the plant. The construct is introduced via Agrobacterium-mediated transformation. In the current study, we are using this technique to study flower and inflorescence development. Aquilegia commonly referred to as columbines, has proven to be a great model system for evolutionary studies. *Aquilegia* has a very interesting flower morphology, it has five floral whorls of organs namely: sepals, petals, stamens, carpels and staminodia—a novel organ. Understanding the genetics of flowering starts with the ABCE genes. Genes responsible for flower development have experienced duplications. From previous studies we know that B gene duplicate *AqAP3-1* have evolved new function, mainly conferring staminodium identity. We will expand this study to understand E gene function and involvement of *AqUFO* homologs in columbines.

Biography: Jesus Preciado is an undergraduate student at Cal Poly Pomona studying plant science. He has a passion for understanding how plants are used in agricultural settings and the importance of genetically improved varieties. He is currently pursuing undergraduate research through the Ronald E. McNair Scholars program. His research focuses on the utilization of a reverse genetics (RNA-interference) to study floral organ development in *Aquilegia* (columbines). He has utilized this technique to *A. coerulera* to downregulate floral meristem identity genes and has successfully documented his results. During this summer, he will be participating in a research internship at Donald Danforth Plant Science Center. Next year, Jesus will be applying to Ph.D. programs.

Patricia Galvan

Mentor: Dr. Shelton Murinda

Title: Use of PCR for Detection of Mastisis-Causing Pathogens Isolated from Bovine Quarter Milk Samples

Abstract: Milk and milk products have a tremendous impact on the US diet in terms of achieving recommended daily intakes of nutrients. The US dairy industry makes approximately $125 billion per year. However, this industry spends ~$1.8 billion annually in economic and veterinary costs as a result of mastitis, an inflammation of the mammary gland. Mastitis can result in a decrease in milk production and negative impact on milk solids components. In this study, Polymerase Chain Reaction (PCR) was utilized to confirm the identity of major mastitis-causing pathogens (i.e., *Escherichia coli*, *Staphylococcus aureus*, and *Streptococcus* species) isolated from quarter milk (QM) samples in a previous study that evaluated the use of Pulsed Electromagnetic Field Therapy (PEMFT) for the reduction of mastitis infections in dairy cattle. A total of 418 QM samples were collected pre- and post-treatment with PEMFT, and 184 samples had bacterial contamination. DNA extraction, morphological, and biochemical tests were performed to determine the identity of the isolates. A PCR protocol that utilizes *S. aureus*, *E. coli*, and three *Streptococcus* sp. pathogen-specific primers that amplify a specific segment of DNA in these bacterial strains was developed. A total of 187 of the QM samples were evaluated, and 107 (57%) tested positive for E. coli and 12 (6%) for Staphylococcus. The effect of PEMFT on mastitis will be assessed after all the samples have been tested. It is hypothesized that PEMFT has the potential of becoming an effective, non-invasive and antibiotic–free treatment capable of reducing mastitis pathogens in dairy cows.

Biography: Patricia Galvan is a proud Salvadoran-Mexican, low-income and first-generation student. She previously attended Citrus Community College where she earned three Associate Degrees. She is a Senior Animal Science major at Cal Poly Pomona who has been conducting research for the past two years. Her research project utilizes Polymerase Chain Reaction to confirm the identity of mastitis-causing pathogens isolated from bovine quarter milk samples. With the help of the McNair Scholars Program and her mentor, Dr. Shelton Murinda, she was able to develop a passion for research to the point that she now aspires to obtain a Ph.D. in Microbiology or Biotechnology. Her success at the undergraduate level is attributed to possessing patience and respect towards others. She will be attending an REU at the University of North Carolina at Chapel Hill this summer.

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2016-2017 McNair Scholars

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The Federal Trio Programs (TRIO) are Federal outreach and student services programs designed to identify and provide services for individuals from disadvantaged backgrounds. TRIO Includes eight programs targeted to serve and assist low-income individuals, first-generation college students, and individuals with disabilities to progress through the academic pipeline from middle school to postbaccalaureate programs.

Designed to assist first-generation, low-income students and those who are underrepresented at the graduate and doctoral level, the program at Cal Poly Pomona was first funded in 1999. The Ronald E. McNair Postbaccalaureate Achievement Program is named for Dr. Ronald E. McNair, one of those who perished aboard the space shuttle Challenger January 1986.

The McNair Scholars Program at Cal Poly Pomona is a one– or two-year program designed to improve students' research skills and prepare them for entering graduate schools and advanced study. This education grant provides an internship opportunity for students to learn how to do research, present their findings at a summer symposium at the national conferences, and successfully apply for and enter graduate school. Through the efforts of the students themselves, the faculty mentors, and the program staff, these students can achieve their goals.

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