11th Annual Undergraduate Research, Scholarship, and Creative Activity Symposium

MAY 3 & 4, 2017

3rd Floor HUB
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11th Annual Undergraduate Research, Scholarship, and Creative Activity Symposium

Schedule of Events

Oral Presentations

Wednesday, May 3, 2017

7:30 – 8:45   Presenter Registration & Poster Setup
              HUB Lobby 3rd Floor

8:30          Registration Officially Opens
              HUB Lobby 3rd Floor

Oral Presentations

9:00 - 10:00  Session 1    HUB 355    Moderator: Dr. Randolph Head, History

1a  Insolvency to Sustainability: An In-depth look at Bankruptcy Recovery for California Cities
    Gregory B. Hutchins, Political Science
    Faculty Mentor: Dr. Ronald Loveridge, Political Science

1b  Good news or Bad News: Analyzing News Through Social Media Platforms
    Grace Khanlian, Political Science
    Faculty Mentor: Dr. Jennifer Merolla, Political Science

9:10 - 10:00  Session 2    HUB 367    Moderator: Dr. Kurt Anderson, Biology

2a  Copper(II) Complexes as a Potential Alternative Antitumor Drug to Cisplatin
    Beverly Ru, Chemistry
    Faculty Mentor: Dr. Jack Eichler, Chemistry

2b  Synthesis of Copper(II) Coordination Complexes with Antitumor Activity
    Michael Baird, Chemistry
    Faculty Mentor: Dr. Jack Eichler, Chemistry

2c  Search for Gluino Production Using Quark/Gluon Discrimination in Pp Collisions at 13 TeV
    Louis Penafiel, Physics and Pure Mathematics
    Faculty Mentor: Dr. Owen Long, Physics and Astronomy
10:10 - 11:00  Session 3  HUB 355  Moderator: Dr. Perry Link, Comparative Literature & Foreign Languages

3a  Education or Training: Factors Shaping the Implementation of Welfare-to-Work Requirements in San Bernardino and Riverside Counties
      Mayra Ceballos, Sociology
      Faculty Mentor: Dr. Ellen Reese, Sociology

3b  From Wormwood Tinctures to Absinthe Mixers: The Instability of Absinthe in Nineteenth-Century Literature and Culture
      Ashlee Simon, English
      Faculty Mentor: Dr. Susan Zieger, English

3c  Analyzing Number Word Usage to Understand Number Concept Acquisition in Young Children
      Alysia Burbidge, Psychology
      Faculty Mentor: Dr. Jon Willits, Psychology

10:10 - 11:00  Session 4  HUB 367  Moderator: Dr. Tanya Nieri, Sociology

4a  Aquí Estamos y No Nos Vamos: Undocumented Latinx Students Navigating Sense of Belonging at a 4-year Institution
      Cynthia Romero, Chicano Studies
      Faculty Mentor: Dr. Covadonga Lamar Prieto, Hispanic Studies

4b  Locating the Presence of Code-Switching in Nineteenth Century Californio Spanish Dialect
      Evelyn Gámez, Spanish and Linguistics
      Faculty Mentor: Dr. Covadonga Lamar Prieto, Hispanic Studies

4c  Always Dwelling in the Sleeping Land: The Spaces of Modernity in Soviet Siberia
      Brian Yang, Languages
      Faculty Mentor: Dr. Kiril Tomoff, History

11:10 - 12:00  Session 5  HUB 355  Moderator: Dr. Sang-Hee Lee, Associate Dean, CHASS

5a  Vogue & Its Global Proliferation of Cosmopolitics
      Eric Anthony Rodriguez, Business Administration Marketing
      Faculty Mentor: Dr. Wendy Su, Media and Cultural Studies

5b  Microsoft’s Paradigm Shift: Strategically Reinventing the Brand, Supporting its Vision for Growth, and Strengthening its Competitive Position
      Shraddha Patel, Business Information Systems
      Faculty Mentor: Dr. Sean Jasso, School of Business

5c  Laboratory Material Transport for the Technology Evolution Components Center
      Hayden Karich, Mechanical Engineering
      Faculty Mentor: Dr. William Grover, Bioengineering
6a  Tropical Relict Plant Species in the California Floristic Province
    Michael Torres, Biochemistry
    Faculty Mentor: Dr. Louis Santiago, Botany and Plant Sciences

6b  Kinetic and Spectroscopic Studies of Rhodobacter sphaeroides W-substituted DMSO Reductase
    Josue Pacheco, Biochemistry
    Faculty Mentor: Dr. Russ Hille, Biochemistry

6c  Analyzing Lyman Alpha Emission in the Intergalactic Medium
    Nicolas Pham, Chemical Engineering
    Faculty Mentor: Dr. George Becker, Physics and Astronomy

11:30 – 12:00 Symposium Opening Ceremony
    Welcome – Richard Cardullo, Interim Vice Provost Undergraduate Education

Theatre Performances:

Macbeth: Act 3, Scene 1
    Faithfulness Adebayo-Ige, Theatre, Film, and Digital Production
    Faculty Mentor: Dr. Bella Merlin, Theatre, Film & Digital Production

Scene from Stop Kiss
    Gloria Olivas, Theatre Film and Digital Production, and Dana Peirce, Theatre, Film and Digital Production
    Faculty Mentor: Dr. Bella Merlin, Theatre, Film & Digital Production

12:00 – 1:00 Poster Sessions

ORAL PRESENTATIONS

1:10 - 2:00 Session 7 HUB 355 Moderator: Dr. Kelechi Kalu, Vice Provost of International Affairs

7a  How a Sitcom Becomes Successful
    Vivian Lei, Theatre
    Faculty Mentor: Dr. Michael Bucklin, Theatre, Film, and Digital Production
Understanding UC Riverside's U-PASS Program and Student Ridership
Victoria Ciudad Real, Global Studies & Public Policy
Faculty Mentor: Dr. Jade Sasser, Gender and Sexuality Studies

Drug Abuse and Politics. What Happens When Rational Actors Become Addicted to Mind Altering Drugs?
Jay Hotrum, Political Science
Faculty Mentor: Dr. Richard Cardullo, Biology

1:10 - 2:00 Session 8 HUB 367 Moderator: Dr. Victor Rogers, Bioengineering

Application of Background Oriented Schlieren Photography for Visualizing Air convection
Nataly Rosales Espitia, Mechanical Engineering
Faculty Mentor: Dr. Marko Princevac, Mechanical Engineering

Design of Electromagnetic Field Generating Device for Study of Stem Cell Behavior
Jonathan Zhang, Mechanical Engineering
Faculty Mentor: Dr. Huinan Liu, Bioengineering

2:10 - 3:00 Session 9 HUB 355 Moderator: Dr. Jade Sasser, Gender & Sexuality Studies

Understanding the Human Voice
Aniella Sara Fields, Religious Studies
Faculty Mentor: Dr. Erith Jaffe Berg, Theatre, Film, and Digital Production

Creating Freedom from Within: Young Women of Color in Group Homes
Joana Chavez, Ethnic Studies and Spanish (Cultural Studies)
Faculty Mentor: Dr. Jennifer Najera, Ethnic Studies

Mexico Under Rightist Ideals: Sinarquismo and the Question of Transnationalism
Cesar Zarate Cano, History
Faculty Mentor: Dr. James Brennan, History

2:10 - 3:00 Session 10 HUB 367 Moderator: Dr. Morris Maduro, Biology

Leaf Carbon Isotopic Composition and Drought Survival Traits in a Chaparral: Desert Transitional Ecosystem of Southern California
Roxana Haro, Biology
Faculty Mentor: Dr. Louis Santiago, Botany and Plant Sciences

Role of Eph Receptor-Ephrin Signaling Networks in Human Neural Crest Development
Izabelle Azar, Biology
Faculty Mentor: Dr. Martin Garcia-Castro, Biomedical Sciences
3:10 - 4:00  Session 11  HUB 355  Moderator: Dr. Thomas Dickson, Assistant Vice Provost of Undergraduate Education

11a  The International Happiness Project: National Averages of Happiness Are Related to Aspects of the World Development Index  
Zizhong (David) Xiao, Psychology  
Faculty Mentor: Dr. Kate Sweeny, Psychology

11b  Physical Effort and Cognitive Control  
Richard Pham, Psychology  
Faculty Mentor: Dr. Weiwei Zhang, Psychology

11c  Redefining Gender Roles in Same-Sex Couples in Collegiate Dancesport  
Emma Mamis, Psychology  
Faculty Mentor: Dr. Imani Johnson, Dance

3:10 - 4:00  Session 12  HUB 367  Moderator: Dr. Darrel Jenerette, Botany and Plant Sciences

12a  Adenosine Deaminase Activity in the Parasitoid Jewel Wasp and its Possible Role in Inducing Hypokinesia in Host Brain  
Cebrina Nolan, Entomology  
Faculty Mentor: Dr. Michael Adams, Entomology, Cell Biology & Neuroscience

12b  Egg Distribution of the Bluetongue Virus Vector, Culicoides sonorensis, and its Relevance for Vector Control  
Natalie Wong, Entomology  
Faculty Mentor: Dr. Bradley Mullens, Entomology

3:10 - 4:00  Session 13  HUB 379  Moderator: Dr. Victor Rodgers, Bioengineering

13a  Synthesis of Silver Nanowires with Ultra-Sharp Tip for Atomic Force Microscopy  
Yanlin Song, Chemical Engineering  
Faculty Mentor: Dr. Ruoxue Yan, Chemical Engineering

13b  Developing Standardized Genome Editing Tools for Pathway Engineering in Yarrowia Lipolytica  
Keith Frogue, Chemical Engineering  
Faculty Mentor: Dr. Ian Wheeldon, Chemical Engineering
SCHEDULE OF EVENTS

POSTER PRESENTATIONS

WEDNESDAY, MAY 3, 2017
HUB 302

BCOE

A 01  High Throughput Measuring of Cells Undergoing Autophagy Using FRET
Gloria Bartalo, Bioengineering
Faculty Mentor: Dr. Jiayu Liao, Bioengineering

A 02  Titania Coatings
Damini Bhana, Chemical Engineering
Faculty Mentor: Dr. Kawai Tam, Chemical and Environmental Engineering

A 03  D. triton Waterproof Egg Sac
Hourng Kim Chea, Chemical Engineering
Faculty Mentor: Dr. David Kisailus, Chemical and Environmental Engineering

A 04  Developing a Physical and Data-Driven Model for a 3-phase Induction Motor for Condition Monitoring and Fault Diagnosis of Static and Dynamic Air-Gap Eccentricities
Karan Gupta, Mechanical Engineering
Faculty Mentor: Dr. Sundararajan Venkatadriagaram, Mechanical Engineering

A 05  GPU-enabled real-time electron dynamics of nitrogen-doped graphene nanoflakes
Ena Mikic, Materials Science and Engineering
Faculty Mentor: Dr. Bryan Wong, Chemical and Environmental Engineering

A 06  A Method for Depositing Microspheres for Use in Lateral Flow Assays
Jenna Roper, Bioengineering
Faculty Mentor: Dr. Hideaki Tsutsui, Mechanical Engineering

A 07  Citrus Orchard Conservation Through PCR
Manoel Tamraz, Bioengineering
Faculty Mentor: Dr. William Grover, Bioengineering
A 08  Expression of Plant Cell Wall Methyltransferases in Bacteria  
James Yen, Bioengineering  
Faculty Mentor: Dr. Eugene Nothnagel, Botany and Plant Sciences  
Faculty Mentor: Dr. Martha Orozco-Cárdenas, Botany and Plant Sciences

A 09  Nitrated water remediation through an electromediated granular activated carbon packed bed reactor  
Hira Yoshihara-Saint, Chemical Engineering  
Faculty Mentor: Dr. David Jassby, Chemical and Environmental Engineering

A 10  Song Covers: Social Response to Current Policy  
Ivy Zeledon, Bioengineering  
Faculty Mentor: Dr. Deborah Wong, Music

CHASS

A 11  An Arabidopsis coregulator functions with WUSCHEL in mediating CLAVATA3 expression and stem cell homeostasis  
Vanessa Ceja, Psychology/Anthropology  
Faculty Mentor: Dr. Venugopala Gonehal, Botany and Plant Sciences

A 12  Discrepancy in Prices Paid to Farmers Between Ethiopia and Kenya 1990-1997  
Iden Emam, Political Science  
Faculty Mentor: Dr. Jana Grittersova, Political Science

A 13  Preschoolers Use Others’ Effort as a Cue to Attention and Learning  
Stephany Garcia, Psychology  
Faculty Mentor: Dr. Rebekah Richert, Psychology

A 14  How Do Individual and Dyadic Parent-Child Emotion Regulation Processes Relate to Conflict During a Frustrating Task?  
Jessica Gonzalez-Lopez, Psychology  
Faculty Mentor: Dr. Elizabeth Davis, Psychology

A 15  The Effect of Dyads’ Conceptions of Followers on Job Satisfaction Through Leader-Follower Relationships  
Wenyi Gu, Psychology  
Faculty Mentor: Dr. Thomas Sy, Psychology

A 16  Effects of Parental Emotional Regulation and Warmth on Children’s Emotion Regulation  
Mahera Khan, Sociology  
Faculty Mentor: Dr. Elizabeth Davis, Psychology
A 17 Validating the Semantic Priming Program in the SCiL iOS Application
Kimberly Miller, Linguistics and Psychology
Faculty Mentor: Dr. Curt Burgess, Psychology

A 18 Intrinsic and Extrinsic Motivation within Contextualized Goals
Emily Moorhouse, Psychology
Faculty Mentor: Dr. William Dunlop, Psychology

A 19 The Role of Positive Emotions in Times of Stress, Anxiety, and Uncertainty
Johnny Nguyen, Psychology
Faculty Mentor: Dr. Kate Sweeny, Psychology

A 20 Environmental Justice: A Derivative Effect of the Existence of Institutionalized Racism
Chika Ojukwu, Political Science
Faculty Mentor: Dr. Bronwyn Leebaw, Political Science

A 21 Explicit Conceptions of Death as Influenced by Family-Related Background Characteristics
Styliani Petraki, Psychology
Faculty Mentor: Dr. Rebekah Richert, Psychology

A 22 Down the Rabbit Hole: Understanding Gender in Surrealism
Judith Pinchot, Psychology
Faculty Mentor: Dr. Daniel Ozer, Psychology

A 23 A Comforting God is Almighty: How Positive and Negative God Concepts Relate to God Making the Impossible, Possible
Laura Posada, Psychology
Faculty Mentor: Dr. Rebekah Richert, Psychology

A 24 The Effect of Sex and Worldview on Empathetic Responding
Rachel Richardson, Psychology
Faculty Mentor: Dr. Rebekah Richert, Psychology

A 25 Children Don't Cite Their Sources: Source Monitoring in Concepts of God
Ashley Claudio Torres, Psychology
Faculty Mentor: Dr. Rebekah Richert, Psychology

A 26 Parents’ Provision of Emotion Regulation Strategies and Children’s Anxiety Predict Physiological Recovery from Disappointment
Cecilia Uribe, Psychology
Faculty Mentor: Elizabeth Davis, Psychology

A 27 The House Office Lottery
Kenneth Zalke, Business Economics
Faculty Mentor: Dr. Carolyn Sloane, Economics
Using CRISPR to generate a tangled Knockout mutant in Arabidopsis thaliana for Division Plane Orientation Investigation
Leslie Aranda, Biochemistry
Faculty Mentor: Dr. Carolyn Rasmussen, Botany and Plant Sciences

The Application of Silica and Metal Oxide Microfibers for Nucleic Acid Extractions
Jocelyn Carballo, Chemistry
Faculty Mentor: Dr. Wenwan Zhong, Chemistry

Expression Profile of Novel Candidates in Neural Crest Development
Jacqueline Cely, Cell, Molecular, and Developmental Biology
Faculty Mentor: Dr. Martín García-Castro, Biomedical Sciences

Behavioral Changes of Macrophages and Neutrophils During Biofilm Induction
Justin Chen, Biochemistry
Faculty Mentor: Dr. David Lo, Biomedical Sciences

Investigating free parameters of a computational subcellular element model
Adam Christensen, General Applied Mathematics
Faculty Mentor: Dr. Mark Alber, Mathematics

Understanding the role of perineuronal nets in developing hippocampal circuits in a mouse model of Fragile X Syndrome
Katherine Espinoza, Neuroscience
Faculty Mentor: Dr. Iryna Ethell, Biomedical Sciences

Bumble bees' buzz pollination: nutritional and energetic mechanisms underlying behavior
Natalie Fischer, Biology
Faculty Mentor: Dr. Hollis Woodard, Entomology

The effect of experimentally manipulating nap frequency on nighttime sleep quality: An actigraphy study
Samantha Granados, Neuroscience
Faculty Mentor: Dr. Sara Mednick, Psychology

Role of Astrocytic ephrin-B1 in Synaptogenesis in the Developing Hippocampus
Sandy Hanna, Neuroscience
Faculty Mentor: Dr. Iryna Ethell, Biomedical Sciences

Determining the role of WUSCHEL interacting cofactors in stem cell homeostasis.
Kyle Hill, Biology
Faculty Mentor: Dr. Venu Gonehal, Biology
A 38  Acute toxicity screening of the LOPAC1280 library in zebrafish embryos
Trina Ho, Biology
Faculty Mentor: Dr. David Volz, Environmental Sciences

A 39  Transportation vulnerability: Developing a data collection for transportation barriers among free clinic patients of San Bernardino County
Phong Hong, Entomology
Faculty Mentor: Dr. Andrew Subica, UCR School of Medicine

A 40  The cellular basis of floral tube length and width variation in polyploids
Amber Lawhorn, Biology
Faculty Mentor: Dr. Amy Litt, Botany and Plant Sciences

A 41  Characterizing Kinectin Localization in Arabidopsis thaliana by Confocal Microscopy
Sareen Leon, Botany and Plant Sciences
Faculty Mentor: Dr. Carolyn Rasmussen, Botany and Plant Sciences

A 42  Structural Study of the Interaction between DNMT1 and Histone Modification
Linhu Li, Biochemistry
Faculty Mentor: Dr. Jikui Song, Biochemistry

A 43  Transferring Microbes: Pesticide Tolerance Mediated by Pollinator Gut Microbiomes
Laura Leger, Entomology
Faculty Mentor: Dr. Quinn McFrederick, Entomology

A 44  Adult mice exposed to aerosolized Alternaria exhibit neuroinflammation in the brainstem but not rest of brain
Matt Jason Llamas, Neuroscience
Faculty Mentor: Dr. Monica Carson, Biomedical Sciences

A 45  Regulation of the bZIP Transcription Factor CPC-1 by the RACK1 Homolog CPC-2 in Neurospora crassa
Berenise Lopez, Biology
Faculty Mentor: Dr. Katherine Borkovich, Plant Pathology & Microbiology

A 46  Motivational Interviewing at the San Bernardino Free Clinic: Increasing smoking cessation, patient satisfaction, and level of trust
Wali Mansour, Biology
Faculty Mentor: Dr. Emma Simmons, UCR School of Medicine

A 47  Functional Analysis of Potential Aedes aegypti Ecdysone Transporters
Roilea Maxson, Biology
Faculty Mentor: Dr. Naoki Yamanaka, Entomology

A 48  Dissecting the Role of DRH-3 in RNA Interference in C. Elegans
Yesica Mercado-Ayon, Cell Molecular and Developmental Biology
Faculty Mentor: Dr. Weifeng Gu, Cell Biology and Neuroscience
Specific composition dependence of molecular chaperones DnaJ/HSP40 for productive protein-substrate interaction
Jose Montano, Chemistry
Faculty Mentor: Dr. Joseph Genereux, Chemistry

RNA Binding Proteins and Their Interactions with One Another
Daniel Nguyen, Biology
Faculty Mentor: Dr. Fedor Karginov, Cell Biology and Neuroscience

Effect on Self-Assembled Cages with Multicomponent Variation
Phoebe Nye, Biochemistry
Faculty Mentor: Dr. Richard Hooley, Chemistry

Comparing Drug Inducible Systems in Drosophila Melanogaster
Marc Pajarillo, Biology
Faculty Mentor: Dr. Omar Akbari, Entomology

Optoelectrical Characterization of MoS2
Pedro Peña, Chemistry
Faculty Mentor: Dr. Ludwig Bartels, Chemistry

The Prevalence of Intimate Partner Violence in University Students and Its Association with Anxiety and Depression Severity
Kasim Pendi, Biology and Neuroscience
Faculty Mentor: Dr. Jose Aguilar, Psychiatry

Metal toxicity in Artemia franciscana
Justin Peng, Biology
Faculty Mentor: Dr. Cynthia Larive, Chemistry

Effect of Carbonate on Manganese and Arsenic mobilization in iron-oxide rich sediments
Mariejo Plaganas, Environmental Sciences
Faculty Mentor: Dr. Samantha Ying, Environmental Sciences

Nonsense mediated mRNA decay inhibition increases DNA damage response in neuro-2A cells under etoposide
Ruchira Puri, Biology
Faculty Mentor: Dr. Sika Zheng, Biomedical Sciences

Examining the Possible Effects of Sleep on Working Memory
Zahab Qazi, Neuroscience
Faculty Mentor: Dr. Sara Mednick, Psychology

The genetic basis for Inheritance of Life History Traits in Trinidanian Guppies
Sarah Ruckman, Biology
Faculty Mentor: Dr. David Reznick, Biology
Unraveling the gaps in the co-transcriptional translation mechanism of E. coli
Gabriela Sanchez, Biochemistry
Faculty Mentor: Dr. Gregor Blaha, Biochemistry

Impact of Western diet-induced obesity on the endocannabinoid system in mouse pancreas.
Jasmin Sanchez, Neuroscience
Faculty Mentor: Dr. Nicholas DiPatrizio, Biomedical Sciences

Fragment-based drug discovery for the inhibition of SUMO E2 protein
Amanda Schaaf, Biology
Faculty Mentor: Dr. Jefferson Perry, Biochemistry

A Study on the Direct and Indirect Relationship between Calling Song and Morphology in the sand cricket, Gryllus firmus
Noah Schlenker, Biology
Faculty Mentor: Dr. Derek Roff, Biology

Evolution of the Magnetic Properties in the Series M2FeB2 (M=V, Nb, Mo, Ta, and W)
Vikas Shukla, Biochemistry
Faculty Mentor: Dr. Boniface Fokwa, Chemistry

Oleophilic Sponge Material for Novel Sustainability
Brandon Tang, Biological Sciences
Faculty Mentor: Dr. Cengiz Ozkan, Mechanical Engineer

Analysis of Ultrasonic Vocalizations in a Mouse Model of Fragile X Syndrome
Maximiliano Abundez Toledo, Neuroscience
Faculty Mentor: Dr. Khaleel Razak, Psychology

Impact of Soybean Oil High Fat Diet of Hypothalamic Feeding Circuits
Edward Truong, Cell, Molecular, and Developmental Biology
Faculty Mentor: Dr. Margarita Curras-Collazo, Cell Biology and Neuroscience

Validating the Semantic Priming Program in the SCiL iOS Application
Giselle Urquijo, Neuroscience
Faculty Mentor: Dr. Curt Burgess, Psychology

Potential Brain Gene Markers for Neurobehavioral Deficits Produced by Developmental Exposure to Indoor Flame Retardants
Brigitte Vazquez, Neuroscience
Faculty Mentor: Dr. Margarita Curras-Collazo, Cell Biology and Neuroscience

A Lexical Road Map for Children’s Understanding of Question Words
Seanna Yang, Biochemistry
Faculty Mentor: Dr. Jon Willits, Psychology
R’Courses

A 71  Jane the Virgin: Intersectionality and Latina Representation
      Yazleen Alonso, Ethnic Studies
      Faculty Mentor: Dr. Alicia Arrizon, Gender and Sexuality Studies

A 72  Harry Potter: The Literary Phenomenon of the 21st Century
      Anastasia Callan, Anthropology
      Faculty Mentor: Dr. John Briggs, English

A 73  Emoji Use and Interpretation
      Jazmine Exford, Linguistics and Spanish
      Faculty Mentor: Dr. Conavadonga Lamar Prieto, Hispanic Studies

A 74  Aaron Sorkin and the need for civic involvement
      Gregory Hutchins, Political Science
      Faculty Mentor: Dr. Ronald O. Loveridge, Political Science

A 75  Blade Runner and Other Alternate Futures: The Science-Fiction of Philip K. Dick
      James Lambert, English
      Faculty Mentor: Dr. Stephen Sohn, English

A 76  Exploring the World of DC & Marvel Comics from the Past to Now
      Aida Perez, Liberal Studies
      Faculty Mentor: Dr. Freya Schiwy, Media and Cultural Studies

A 77  Down the Rabbit Hole: Understanding Gender in Surrealism
      Judith Pinchot, Psychology
      Faculty Mentor: Dr. Aleca Le Blanc, Art History

A 78  The Psychology of Studying
      Kelly Renteria, Psychology
      Faculty Mentor: Dr. John Franchak, Psychology

A 79  Designing the Ideal Community: Urban Development and Gentrification
      LeonardoVichis-Zarate, Art History
      Faculty Mentor: Dr. Aleca Le Blanc, Art History
SCHEDULE OF EVENTS
ORAL PRESENTATIONS

THURSDAY, MAY 4, 2017

7:30 - 8:45   Presenter Registration & Poster Setup
              HUB Lobby 3rd Floor

8:30          Registration Officially Opens
              HUB Lobby 3rd Floor

ORAL PRESENTATIONS

9:10 - 10:00  Session 14  HUB 355  

14a  Location Analytics to Develop Targeted Solicitations for UCR Donors
     Shanze Athar, Business Administration
     Faculty Mentor: Dr. Asish Satpathy, Business Administration

14b  The Containing Spaces of Experiments: US Cold War influence in Guatemala through Medical Research
     Celeste Navas, History
     Faculty Mentor: Dr. Dana Simmons, History

14c  Symmachus and the Dialogues of Power in the Late Roman Imperial Government
     Nasiha Alicic, History
     Faculty Mentor: Dr. Michele Salzman, History

9:10 - 10:00  Session 15  HUB 367  

15a  Plant Biodiversity in Southern California Parks
     Mia Rochford, Plant Biology
     Faculty Mentor: Dr. Darrel Jenerette, Botany and Plant Sciences

15b  Cytotoxicity of Electronic Cigarette Solvents: Propylene Glycol and Glycerol
     Malcolm Tran, Biochemistry
     Faculty Mentor: Dr. Prue Talbot, Cell Biology and Neuroscience
9:10 - 10:00  Session 16  HUB 379  Moderator: Dr. Morris Maduro, Biology

16a  Prenol and its effect on Entomopathogenic Nematodes as a Dispersal Cue  
Kassandra Kin, Cell, Molecular, and Developmental Biology  
Faculty Mentor: Dr. Adler Dillman, Parasitology

16b  Crime Solving Insects: A Fly's Point of View  
Seth Freitas, Entomology  
Faculty Mentor: Dr. Alec Gerry, Entomology

10:10 - 11:00  Session 17  HUB 355  Moderator: Dr. Rebekah Richert, Psychology

17a  Embodied Identities: The Experience of Coming Out as UndocuQueer  
Liliana Ramirez, Anthropology  
Faculty Mentor: Dr. Jennifer Najera, Ethnic Studies

17b  Using Linguistic Analyses to Predict Positive and Negative Schizophrenia Symptoms  
Lin Khern Chia, Psychology  
Faculty Mentor: Dr. Jon Willits, Psychology

17c  Personality Traits and Thoughts of Extramarital Sex in Married Couples  
Judith Pinchot, Psychology  
Faculty Mentor: Dr. Daniel Ozer, Psychology

10:10 - 11:00  Session 18  HUB 367  Moderator: Dr. Michael McKibben, Divisional Dean of Student 
Academic Affairs, CNAS

18a  Does Sleep Modulate Emotional Memories?  
Zahab Qazi, Neuroscience  
Faculty Mentor: Dr. Sarah Mednick, Psychology

18b  Menthol Increases Reactive Oxygen Species in Human Lung Epithelial Cells Exposed at the Air-Liquid Interface  
Lindsey Bustos, Neuroscience  
Faculty Mentor: Dr. Prue Talbot, Cell Biology, and Neuroscience

18c  Impact of a Western Diet on Lipid Signaling Molecules in the Left ventricle of Diet-Induced Obese Mice  
Kevin Mortazavi, Neuroscience  
Faculty Mentor: Dr. Nicholas DiPatrizio, Biomedical Sciences

11:10 - 12:00  Session 19  HUB 355  Moderator: Dr. Michael McKibben, Divisional Dean of Student 
Academic Affairs, CNAS

19a  Using Linguistic Analyses to Predict and Understand Schizophrenia Outcomes  
Stellamaris U. Ohakamnu, Biology  
Faculty Mentor: Dr. Jon Willits, Psychology
19b  Heart of Creations: Space Fiction Novel Based on Some True Astronomical Concepts  
Mehruba Zaman, Biology  
Faculty Mentor: Dr. Bahram Mobasher, Physics and Astronomy

18c  Effects of Single Motherhood on Anxiety  
Anthony Atalla, Biology  
Faculty Mentor: Dr. Wendy Saltzman, Biology

11:10 - 12:00  Session 20  HUB 367  
Moderator: Dr. Kelley Barsanti, Chemical/Environ. Engineering

20a  Planarity in Microfluidic Netlists  
Hsin-Yu (Cindy) Fan Chiang, Computer Science  
Faculty Mentor: Dr. Philip Brisk, Department of Computer Science and Engineering

20b  Reducing Microfluidic Very Large Scale Integration (mVLSI) Chip Area by Seam Carving  
Karen Kong, Computer Science  
Faculty Mentor: Dr. Philip Brisk, Department of Computer Science and Engineering

12:00 – 1:00  Poster Sessions  HUB 302

ORAL PRESENTATIONS

1:10 - 2:00  Session 21  HUB 355  
Moderator: Dr. Dana Simmons, History

21a  The Wheel of Time: Reflections on the Kālacakra Sand Mandala  
Sierra Lapoint, Art History/Religious Studies; Philosophy  
Faculty Mentor: Dr. Matthew King, Religious Studies

21b  Music and the Pentecostal Religious Experience: “When the Iron is Hot, You Got to Strike”  
Aldo Martinez, Religious Studies  
Faculty Mentor: Dr. Deborah Wong, Music

21c  Repurposing the Past: Architectural Appropriation in Post-Classical Athens  
Samuel James Finch, Anthropology/Classical Studies  
Faculty Mentor: Dr. Charles Graninger, History
1:10 - 2:00  Session 22  HUB 367  Moderator: Dr. Kelley Barsanti, Chemical and Environmental Engineering

22a  Activation of Entomopathogenic Nematode IJs is Context Dependent
Carter Gerke, Cell, Molecular, and Developmental Biology
Faculty Mentor: Dr. Adler Dillman, Department of Nematology

22b  Selective Glioblastoma Susceptibility to Pharmacological Ascorbate Therapy: Significance of Peroxisomal Latency
Jacqueline Mantooth, Bioengineering
Faculty Mentor: Dr. Victor G. J. Rodgers, Bioengineering

22c  Industry Level Quality Control in a University Research Lab
Raymond Iu, Bioengineering
Faculty Mentor: Dr. William Grover, Bioengineering

2:10 - 3:00  Session 23  HUB 367  Moderator: Dr. Randolph Head, History

23a  Leadership Behaviors across Contexts
Dulce Wilkinson, Psychology
Faculty Mentor: Dr. David Funder, Psychology

23b  Measuring a High Dimensional Memory Model’s Ability to Distinguish Between Instrument and Manner Verbs
Kimberly Miller, Linguistics and Psychology
Faculty Mentor: Dr. Curt Burgess, Psychology

23c  Vienbenidos a San Juan: On the Distribution of Allophonic [v] for Spanish Phoneme /b/
Jazmine Exford, Linguistics and Spanish
Faculty Mentor: Dr. Covadonga Lamar Prieto, Hispanic Studies

2:10 - 3:00  Session 24  HUB 379  Moderator: Dr. Thomas Dickson, Assistant Vice Provost of Undergraduate Education

24a  Maximum Likelihood Versus Alternative Regularized Estimators for Logistic Regression Models
Gabriel Ruiz, Statistics
Faculty Mentor: Dr. Subir Ghosh, Statistics

24b  Comparing Computational Models of Semantic Memory
Katherine Noble, Computational Mathematics
Faculty Mentor: Dr. Curt Burgess, Psychology
SCHEDULE OF EVENTS

POSTER PRESENTATIONS

THURSDAY, MAY 4, 2017
HUB 302

BCOE

B 01  Measuring Controlled Release Rates of Pharmaceutical Drugs using Vibrating Glass Tubes
Jessica Lin, Bioengineering
Faculty Mentor: Dr. William Grover, Bioengineering

B 02  Biomineralized Seed Coating in Pyrophytic Plants with an Energy-Absorbing Utility
Sarah McElligott, Chemical Engineering
Faculty Mentor: Dr. David Kisailus, Chemical and Environmental Engineering

B 03  Quantitative PD-L1/PD-1 protein-protein analysis for Cancer and T cell interactions
Justin Tang, Bioengineering
Faculty Mentor, Dr. Jiayu Liao, Bioengineering

B 04  Characterization and Application of Multifunctional Oleophilic hydrophobic mesoporous graphite sponge with antibacterial and ferromagnetic properties
Zhongxuan Zhang, Chemical Engineering
Faculty Mentor: Dr. Cengiz Ozkan, Mechanical Engineering

CHASS

B 05  Analysis of Extant Lumber from the Smith Brothers Borax Works at Teels Marsh, Nevada
Michael Amorelli, Anthropology/Classical Studies
Faculty Mentor: Matthew Hall, Anthropology

B 06  Booms and Busts: The Impact and Implications of Water on the Development of Perris
John Berba, Political Science/International Affairs
Faculty Mentor: Dr. Richard Arnott, Economics
B 07  Mindfulness Meditation Attenuates Gender Differences in Emotional Reactivity/Responding  
    Stephen Chau, Psychology  
    Faculty Mentor: Dr. Elizabeth Davis, Psychology

B 08  Construction of a ten1 Mutant Strain and Investigation of DNA Damage Localization in the model  
    Saccharomyces cerevisiae  
    Sheri Chu, Psychology  
    Faculty Mentor: Dr. Connie Nugent, Cell Biology and Neuroscience

B 09  A Family of Unequals: The Lived Experiences and Consciousness of Farmworkers  
    Mirella Deniz-Zaragoza, Sociology  
    Faculty Mentor: Dr. Ellen Reese, Sociology/Labor Studies

B 10  The Effect of Discrete Negative Emotions on Global-Local Processing  
    Fabian Fontanilla, Psychology  
    Faculty Mentor: Dr. Elizabeth Davis, Psychology

B 11  Decision-Making In Action: Examining Effects of Precrastination and End-State Comfort  
    Wenyi Gu, Psychology  
    Faculty Mentor: Dr. David Rosenbaum, Psychology

B 12  Positive Emotionality Mediates the Relationship Between Self-Perceptions of Leadership and Leader  
    Effectiveness/Job Satisfaction  
    Amy Heisinger, Psychology  
    Faculty Mentor: Dr. Thomas Sy, Psychology

B 13  Transnational Labor Alliances (TLA) Database Project: Coding Successes and Failures  
    Ivy Kim, Political Science/International Affairs  
    Faculty Mentor: Dr. Marissa Brookes, Political Science

B 14  The Influence of Mindfulness Meditation on Distinct Facets of Negative Emotional Reactivity  
    Sarina Lee, Psychology  
    Faculty Mentor: Dr. Elizabeth Davis, Psychology

B 15  How Do University Students Think About Intensive Health Interventions? A Qualitative Study  
    Leslie Lopez, Psychology  
    Faculty Mentor: Dr. Howard Friedman, Psychology

B 16  Feathers, Teeth, Tales and Temples: Ethnozoology of Bird-Like Creatures on Temple Walls in the  
    Ancient Angkor Region  
    Stephen Marts, Anthropology  
    Faculty Mentor: Dr. Worku Nida, Anthropology

B 17  Does napping boost benefits of brain-training for working memory?  
    Rainita Narender, Psychology  
    Faculty Mentor: Dr. Aaron Seitz, Psychology
B 18  The Containing Spaces of Experiments: US Cold War influence in Guatemala through Medical Research
Celeste Navas, History
Faculty Mentor: Dr. Dana Simmons, History

B 19  Sadness Relates to Compassion Toward Others, But Only For Men
Isabel Perez, Psychology
Faculty Mentor: Dr. Elizabeth Davis, Psychology

B 20  Using Sentiment Analysis to Understand Media Coverage of the 2016 Presidential Election
Annie Pham, Linguistics/Computer Science
Faculty Mentor: Dr. Jon Willits, Psychology

B 21  Elderly Adults’ Quality of Social Interaction with Children Present
Helena Sidrak, Psychology
Faculty Mentor: Dr. Chandra Reynolds, Psychology

B 22  Heritage Speakers’ Language Proficiency and its Relation to Executive Control
Yasmeen Sheikh, Psychology
Faculty Mentor: Dr. Eve Higby, Psychology

B 23  How are students’ characteristics associated with their goals?
Mabel Wong, Psychology
Faculty Mentor: Dr. Daniel Ozer, Psychology

CNAS

B 24  Parasite virulence relies on the nematode rather than its symbiotic bacteria in the case of the cricket specialist parasite Steinernema scapterisci.
Lauren Allison, Biology
Faculty Mentor: Dr. Adler Dillman, Nematology

B 25  Assessment of microstructural changes in human brains affected by Alzheimer’s Disease using Diffusion Tensor Imaging (DTI) and single shell Neurite Orientation Dispersion and Density Imaging (NODDI)
Barsam Barsamian, Neuroscience
Faculty Mentor: Dr. Shu-Wei Sun, Cell Biology and Neuroscience

B 26  Mechanical Transmission of Pollinator and Plant Pathogens via Insect Pollinators
Jonah Bodden, Plant Biology
Faculty Mentor: Dr. Erin Rankin, Entomology

B 27  Anti-inflammatory and neuroprotective properties of neuregulin-1 following ischemic stroke in rats
Jaime Brito, Biology
Faculty Mentor: Dr. Byron Ford, Biomedical Sciences
RELmα protects from chronic lung damage caused by parasitic hookworm infection
Abigail Burr, Microbiology
Faculty Mentor: Dr. Meera Nair, Biomedical Science

How do emotion regulation strategies to regulate anger and physiology relate to anger dysregulation in children?
Alan Cabrera, Biology
Faculty Mentor: Dr. Elizabeth Davis, Psychology

Characterize role of Pax3/Pax7 in Neural Crest specification using mouse model
Tuong Cao, Biochemistry
Faculty Mentor: Dr. Martin Garcia-Castro, Biomedical Sciences

Milk Nutrient Content in California Mice: Effects of Parity and Lactation Stage
Dariana Chow, Biology
Faculty Mentor: Dr. Wendy Saltzman, Biology

Covalent Organic Frameworks for the Upconversion of Photons with Nanocrystal Light Absorbers
Tony Dorado, Chemistry
Faculty Mentor: Dr. Ming Lee Tang, Chemistry

Timing of developmental stages in the fruit of desert tobacco
Kevan Elkins, Plant Biology
Faculty Mentor: Dr. Amy Litt, Department of Botany & Plant Sciences

Characterizing the Structure and Formation of Organized Lymphoid Tissues in the Gut and Lung In Models of Disease and Inflammation
Mathea Elnar, Cell, Molecular and Developmental Biology
Faculty Mentor: Dr. David Lo, Biomedical Sciences

Analyzing the Target of Rapamycin Signaling Pathway in Bumble Bees
Mauricio Flores, Cell, Molecular and Developmental Biology
Faculty Mentor: Dr. Hollis Woodard, Entomology

Study of Fraxinellone as a Neuroprotective Molecule: The Extraction and Synthesis of Fraxinellone Derivatives
Jingya Gao, Biology
Faculty Mentor: Dr. Dave Martin, Chemistry

Investigation of potential suppressors of stn1-281t in Saccharomyces cerevisiae
Fabian Gonzalez, Microbiology
Faculty Mentor: Dr. Connie Nugent, Cell Biology & Neuroscience

Provider and Patient Satisfaction within Student Run San Bernardino Free Clinic
Samantha Granados, Neuroscience
Faculty Mentor: Dr. Emma Simmons, UCR School of Medicine
B 39  Splitting Photons: Singlet Fission in a Hybrid System  
Danielle Hamilton, Biochemistry  
Faculty Mentor: Dr. Ming Lee Tang, Chemistry

B 40  Impaired PV and PNN Expression in CA1 Hippocampus May Underlie Contextual Recall Deficits After Auditory Fear Conditioning In FMR1 Knockout Mice  
Yasmien Hanania, Neuroscience  
Faculty Mentor: Dr. Iryna Ethell, Biomedical Sciences

B 41  Assessing the morphological effects of aquatic acidification on model organism Daphnia magna  
Kymberly Howo, Biology  
Faculty Mentor: Dr. Kurt Anderson, Biology

B 42  The Effect of Mindfulness Meditation on Positive Emotional Intensity After Experiencing Negative Emotion  
Sonia Josemoan, Biochemistry  
Faculty Mentor: Dr. Elizabeth Davis, Psychology

B 43  Analyzing Self-Interacting Dark Matter Halo Simulations  
Renata Koontz, Physics  
Faculty Mentor: Dr. Hai-Bo Yu, Physics and Astronomy

B 44  Polybrominated Diphenyl Ether (PBDE) Induced Aberration in Intraneocortical Connections and Changes in Affective Behaviors  
Julia Krum, Neuroscience  
Faculty Mentor: Dr. Margarita Curras-Collazo, Cell Biology and Neuroscience

B 45  Sterility in First Generation Polyploids  
Amelda Kurti, Microbiology  
Faculty Mentor: Dr. Amy Litt, Botany and Plant Sciences

B 46  Construction of a Cavity Enhanced Absorption Spectrometer for HONO Detection  
Eileen Lek, Environmental Sciences  
Faculty Mentor: Dr. Jingsong Zhang, Chemistry

B 47  Rational Based Drug Discovery for Age-Related Macular Degeneration  
Erica Li, Biochemistry  
Faculty Mentor: Dr. Jeff Perry, Biochemistry

B 48  Effects of climate change and Bifenthrin on the olfactory behavior of juvenile chinook salmon (Oncorhynchus Tshawytscha).  
Danny Luu, Environmental Sciences  
Faculty Mentor: Dr. Daniel Schlenk, Environmental Sciences
B 49  Testing for Heterodimerization of Moss Methyltransferases in Progeny of Genetically Crossed Transgenic Tobacco Plants
Haley Masters, Biology
Faculty Mentor: Dr. Eugene Nothnagel, Botany and Plant Sciences

B 50  Investigation of How the Entomopathogenic Nematode Heterorhabditis bacteriophora Suppresses the Host Immune System
Paul Medina, Cell, Molecular, and Developmental Biology
Faculty Mentor: Dr. Adler Dillman, Nematology

B 51  Direct and Indirect Impacts of Black Lights on Secondary Organic Aerosol formed from Oxidation of 1-methylnaphthalene
Justin Min, Chemistry
Faculty Mentor: Dr. Roya Bahreini, Environmental Sciences

B 52  Investigating how second language age of acquisition affects language learning and generalization
Zoya Mirza, Neuroscience
Faculty Mentor: Dr. Judith Kroll, Psychology

B 53  The Differences in STEM Feelings and Interest Between Boys and Girls
Brandon Ngo, Biology
Faculty Mentor: Dr. Rebekah Richert, Psychology

B 54  Using a Toxicology/Disease-in-a-Dish Model with Live Cell Imaging and Video Bioinformatics to Determine the Effects of Nicotine on Pluripotent Stem Cell Health and Survival
Leland Nguyen, Biology
Faculty Mentor: Dr. Prue Talbot, Cell, Molecular, and Developmental Biology

B 55  UV radiation induced DNA damage response is exacerbated in NMD deficient N2A cells
Israel Nunez, Neuroscience
Faculty Mentor: Dr. Sika Zheng, Biomedical Sciences

B 56  Determining the stem cell potential of neural crest during its specification from embryonic stem cells
Lipsa Patel, Biochemistry
Faculty Mentor: Dr. Martin Garcia-Castro, Biomedical Sciences

B 57  Cuticular Hydrocarbons of Elaterid Beetles: Composition and Possible Functions as Contact Pheromones
Daniel Perry, Biology
Faculty Mentor: Dr. Jocelyn Millar, Entomology

B 58  Formica francoeuri Responses to Bee Pheromones and Chemical Cues
Phi Phan, Biology
Faculty Mentor: Dr. Erin Wilson-Rankin
B 59  Social Polymorphism in a California Native Ant  
Daniel Pierce, Biology  
Faculty Mentor: Dr. Jessica Purcell, Entomology  

B 60  Investigation of HOTAIRM1 in clear cell carcinoma  
Shawn Poag, Biochemistry  
Faculty Mentor: Dr. Ernest Martinez, Biochemistry  

B 61  The Role of Semen in the Evolution of Reproductive Mode  
Sarah Ruckman, Biology  
Faculty Mentor: Dr. David Reznick, Biology  

B 62  Analysis of wing sound of hummingbirds and bees  
Irini Saad, Neuroscience  
Faculty Mentor: Dr. Christopher Clark, Biology  

B 63  Developing a Frequency Calibration Model for Tellurium Spectra  
Joshua Salazar, Physics  
Faculty Mentor: Dr. Harry Tom, Physics and Astronomy  

B 64  Synthesis of Neuroprotective Flavalins  
Lauren Sangster, Biochemistry  
Faculty Mentor: Dr. David Martin, Chemistry  

B 65  Eigenvalue Distributions of Random Matrices  
Shannon Sweitzer, Mathematics  
Faculty Mentor: Dr. Michael Hartglass, Mathematics  

B 66  Structural Studies on the Inhibition of Cancer Promoting Matrix Metalloproteinase-14 by an Antibody  
Timothy Tam, Philosophy  
Faculty Mentor: Dr. Gregor Blaha, Biochemistry  

B 67  Identifying Biofilm-Disrupting Properties of N-acetyl-L-cysteine  
Amanda Tedesco, Neuroscience  
Faculty Mentor: Dr. Manuela Martins-Green, Cell Biology and Neuroscience  

B 68  Exploration of Transposable Element Families in the Citrus Genome Fairchild  
Travis Wrightsman, Biochemistry  
Faculty Mentor: Dr. Susan Wessler, Botany and Plant Sciences  

B 69  Synthesis and Characterization of C12H22N12O2 using Spectroscopy and Energy Calculations of a Triazole-containing Fragment  
Eduardo Zamora, Chemistry  
Faculty Mentor: Dr. Thomas Morton, Chemistry
The Role for Muscarinic Acetylcholine Receptors in Endocannabinoid Synthesis in the Mouse Heart
Mellonie Zhang, Chemistry
Faculty Mentor: Dr. Nicholas DiPatrizio, Biomedical Sciences

Blockchain For The Public Sector
Turner Stanton, Business Administration
Faculty Mentor: Dr. Ronald O. Loveridge, Political Science

Female Comedic Icons: On and Off the Screen
Adrianna Chacon, English
Faculty Mentor: Dr. Laura Harris, Media & Cultural Studies

Sociological Topics in Music: Television, Musicians, and Movies
Carlos Contreras, Sociology/Law and Society
Faculty Mentor: Dr. Ellen Reese, Sociology

Harry Potter: The Literary Phenomenon of the 21st Century
Emily De La Fuente
Faculty Mentor: Dr. John Briggs & Carrie Jean Schroeder, University Writing Program

Analysis of Folktales, Fables, & Fairytales
Christine Estadilla, Global Studies
Faculty Mentor: Dr. Perry Link, Comparative Literature & Foreign Languages

Critical Refugee Studies
Phong Hong, Entomology
Faculty Mentor: Dr. Bronwyn Leebaw, Political Science

Leadership in Sustainable Development
Hoan Pham, Global Studies
Faculty Mentor: Dr. Bronwyn Leebaw, Political Science

Films of Hayao Miyazaki
Ljubica Jaich, English
Faculty Mentor: Dr. Lan Duong, Media & Cultural Studies
B 79  Introduction to MATLAB and Programming Logic  
Chirawat Sanpakit, Mechanical Engineering  
Faculty Mentor: Dr. Sundararajan Venkatadriagaram, Mechanical Engineering

B 80  Petri Dish to Patient: Stem Cells  
Jon (Man) Wong, Neuroscience  
Faculty Mentor: Dr. Prue Talbot, Cell Biology & Neuroscience

B 81  Stumbling on Happiness: Imagining Your Future Selves  
Zizhong Xiao, Psychology  
Faculty Mentor: Dr. Kate Sweeny, Psychology

3:30 – 4:30  CLOSING CEREMONY  HUB 302

*Presentation of Best Oral and Poster Presentation Awards and Closing Remarks*
THANK YOU TO THE CAMPUS PARTNERS WHO MADE THE SYMPOSIUM A GREAT SUCCESS

- Faculty moderators
- Oral presentation evaluators
- Poster judges
- Undergraduate Education Team
Abstracts

Maximiliano Abundez Toledo, Neuroscience; Teresa Wen, Jeffrey Rumschlag, Jamiela Kokash
Faculty Mentor: Dr. Khaleel A. Razak, Psychology

Analysis of Ultrasonic Vocalizations in a Mouse Model of Fragile X Syndrome

Fragile X Syndrome (FXS) results from a single gene mutation that leads to autism, intellectual disability, and communication abnormalities. This study focuses on communication abnormalities, which, in humans, include stuttering, repetition, and articulation errors. In order to gain a deeper understanding of the molecular mechanisms driving these deficits, we used a FXS mouse model, the Fmr1 knockout (KO) mouse. This model is useful for studying communication abnormalities in FXS because male KO mice produce fewer ultrasonic vocalizations (USVs) during mating, indicative of abnormal social communication, similar to FSX patients. Minocycline treatment from birth to 2 months has been shown to rescue USVs in KO mice, but it is not known if this treatment period can be reduced to a particular time frame. Therefore, we investigated if treatment past the early developmental period would be effective, given that most FXS children are treated only during later developmental periods. Wild-type (WT) and KO mice were treated with minocycline during 1-2 months of age, and mating-elicited USVs were recorded and analyzed for individual call duration, bandwidth, peak frequency, and call rate. After minocycline treatment from 1-2 months of age, WT and KO exhibited similar USV content, indicating that minocycline reversed USV deficits in KO mice when limited to later development. By understanding the timeline for minocycline treatment and reversal of communication deficits in the FXS mouse model; we are a step further in establishing effective FXS drug treatment plans, which may provide crucial insight for developing drug therapies for FXS patients.

Nasiha Alicic, History
Faculty Mentor: Dr. Michele R. Salzman, History

Symmachus and the Dialogues of Power in the Late Roman Imperial Government

The traditional view of the urban prefecture of Rome during the late Roman Empire has been that it was a position in which the urban prefect did not have much of his own power and was limited to a position of fulfilling the Emperor’s wishes. Looking at the writings of Symmachus, urban prefect of Rome from 384 to 385 however, challenges this view. Symmachus’ skilful use of language in his relations, orations, and personal letters showed that Symmachus was able to build connections that helped protect him and advance his standing in society. Additionally, he skillfully expressed his political views, asserted his independence, and tried to influence the Emperor into taking actions on his behalf in order to increase and protect Symmachus’ own political and social position.
Lauren Allison, Biology; Dihong Lu, Sudarshan Aryal
Faculty Mentor: Dr. Adler R. Dillman, Nematology

Parasite Virulence Relies on the Nematode Rather Than Its Symbiotic Bacteria in the Case of the Cricket Specialist Parasite Steinernema Scapterisci

Entomopathogenic nematodes (EPNs) are insect parasites used in biological control. Free-living, developmentally arrested infective juveniles (IJJs) find and infect insects. Upon infection, IJJs release symbiotic bacteria into the host. IJ/bacterial complexes are efficient parasites, usually killing their host within 72 hours. For most EPNs, it is thought that their bacterial symbiont is the driver of virulence while the nematode serves primarily as a vector. We wanted to understand how this might differ between specialist and generalist parasites. To do this we tested the virulence of the specialist parasite Steinernema carpocapsae (Sc) and the specialist parasite S. scapterisci (Ss) in Gryllus firmus sand crickets. Sc is capable of infecting over 250 insects across several orders while Ss is a cricket specialist. Sc associates with the bacterium Xenorhabdus nematophila and Ss associates with X. innexi. To dissect the various contributions to virulence, we tested the virulence of nematodes IJJs carrying their bacterial symbionts (symbiotic IJJs), and we tested the virulence of the bacteria alone. In testing symbiotic IJJs we found that Ss is more virulent than Sc. When we tested the toxicity of the bacteria, we were surprised to find that the crickets were highly resistant to bacterial infection. However, we found that X. nematophila was significantly more toxic to the crickets. In conclusion, the toxicity of the Ss/X. innexi complex is either synergistic or relies heavily on the contribution of the nematode partner. In the future, we plan to test the virulence of bacteria-free nematodes.

Michael Amorelli, Anthropology/Classical Studies
Faculty Mentor: Dr. Matthew C. Hall, Anthropology

Analysis of Extant Lumber from the Smith Brothers Borax Works at Teels Marsh, Nevada

Two major questions surround the lumber used in the processing operations at the Smith Brothers Borax Works at Teels Marsh, Nevada: Where did it come from and why has it survived in such good condition for so long? The penetration of borax into the wood grain, as well as the extant surface crust, accounts for the lack of insect and microbial activity that would otherwise lead to decomposition. This current research has so far identified two potential species and two potential sources for the lumber. Pinus jeffreyi grows in the high elevations of the eastern slope of the Sierra Nevada Range and may have been carried down by wagon and milled at a nearby town. Primary sources suggest that lumber was brought to the site on the Wadsworth-Columbus freight route from the Wadsworth station on the Transcontinental Railroad. Lumber brought from Wadsworth was likely cut and milled in the Lake Tahoe Basin, and was most likely P. ponderosa. To positively identify lumber species is difficult in this desiccated form and will require further testing as there is visually little variation between the two when milled. Understanding the lumber source may shed light on labor dynamics in the vicinity of Teels Marsh and may provide answers about production mills from the period that may have been lost, and understanding the biological and chemical processes involved in borate-exposed lumber may have substantial implications for the recovery of organic artifacts that would otherwise be lost.
Leslie Aranda, Biochemistry  
Faculty Mentor: Dr. Carolyn Rasmussen, Botany and Plant Sciences  
Using CRISPR to Generate a Tangled Knockout Mutant in Arabidopsis Thaliana for Division Plane Orientation Investigation

Proper symmetric cell division is important for plant development. The exact mechanism by which the division plane is determined is not fully understood. During plant cell division, before mitosis, a microtubule array called a preprophase band (PPB) forms and accurately predicts the location of the new cell wall. At the end of mitosis, another microtubule array called a phragmoplast places the new cell wall at the location previously marked by the PPB. TANGLED (TAN) is a protein that localizes to the cortical division site during mitosis. TAN is a microtubule binding protein that is necessary to properly place the new cell wall. The tan mutant in maize exhibits a dwarf phenotype with aberrant cell divisions. However, different alleles for TAN in Arabidopsis thaliana do not exhibit a robust phenotype like maize. Our hypothesis is that the current tan mutant alleles in Arabidopsis thaliana do not represent a true TAN null phenotype. We are interested in utilizing CRISPR/Cas9 technology to create a knockout allele of TAN and see if there is a phenotype in Arabidopsis to be further investigated. We have designed various guide RNAs that target different early 5’ sequences in TAN for a higher chance of attaining a full knockout. We are currently looking for the best method to screen for these potential mutants. Once we find a highly reliable method, we will screen through the seed population to find a TAN mutant in Arabidopsis thaliana to better study the role this protein plays during division plane orientation.

Anthony Atalla, Biology; Meng Zhao, Biology  
Faculty Mentor: Dr. Wendy Saltzman, Biology  
Effects of Single Motherhood on Anxiety

It has been found that single motherhood has adverse effects on women’s mental health. To develop a relevant animal model, we investigated effects of single motherhood on anxiety in the California mouse (Peromyscus californicus), a monogamous rodent in which both parents provide extensive care for their offspring. Adult females from three reproductive conditions (paired mothers, single mothers, and non-breeding females) were housed under two cage conditions (standard lab cages and cages requiring animals to climb towers to obtain food and water). All females underwent an open-field test, a common test of anxiety-like behavior in rodents. Distance traveled in the open field is considered a negative index of anxiety-like behavior; whereas, time spent in the corners and number of fecal boli produced are positive indices. We found no significant effects of the reproductive or cage conditions on either the number of fecal boli or movement in the open field. However, there was a negative correlation between the number of fecal boli produced and total distance traveled ($r = -0.443, P= 0.045$). Our results may be restricted by small sample sizes; therefore, we are continuing to test more animals. In addition, we are evaluating possible effects of single motherhood on other measures of anxiety and depression.
Shanze Athar, Business Administration  
Faculty Mentor: Dr. Asish Satpathy, Business Administration  
*Location Analytics to develop targeted solicitations for UCR Donors*

Our research develops descriptive information on existing donors giving patterns and characteristic to allow UCR for more targeted solicitation for future campaigns. We start our research by looking at the existing database that contains street level address, particularly zip code of individuals. GIS (Geographic Information System) analysis enables us to better visualize the donors’ data based on the neighborhood demographics, Tapestry and lifestyle segmentation and other spatial correlations to improve the planning efforts for future campaigns. We use ESRI’s ArcGIS Business Analyst ([bao.arcgis.com](http://bao.arcgis.com)) and (ArcgisOnline.com) to conduct this research.

Phong Au-Hong, Entomology; Sang Nguyen, School of Medicine  
Faculty Mentor: Dr. Andrew Subica, School of Medicine  
*Transportation Vulnerability: Developing a Data Collection for Transportation Barriers Among Free Clinic Patients of San Bernardino County*

Transportation barriers have affected low-income individuals, causing them to often miss clinic appointments, adhere to medical treatments, and poorly manage their health. Transportation has been found to correlate with poorer access to healthcare, which increases patient’s risk of chronic diseases. Therefore, a long-term study of transportation barriers is necessary to understand how free clinics improve quality of care for marginalized communities. The study at the San Bernardino Free Clinic explores the relationships between transportation barriers, including accessibility and availability, and other important known healthcare barriers (i.e., socioeconomic and insurance coverage). Patients receive a modified survey, conducted from previous demographic studies, during the waiting time prior to receiving medical care. The one-year study conduct correlations of patients’ transportation accessibility and availability in relation to socioeconomic status, health status, and insurance history. An anticipated result shows that decreased transportation access associates with low SES, decreased insurance coverage, poorer health status, and lower housing stability. The evidence of this research will be used to encourage city officials to execute policy and infrastructure improvements that prioritize transportation accessibility. Furthermore, this study will help the clinic implement new health programs, design interventions based on each season tailored to SBFC patients, and make the information accessible for other student-run free clinics.
Izabelle Azar, Cell, Molecular, and Developmental Biology; Nabjot Sandhu  
Faculty: Dr. Martin I. Garcia-Castro, Biomedical Sciences  
Role of Eph Receptor-Ephrin Signaling Networks in Human Neural Crest Development

The neural crest (NC) is essential for proper development of vertebrate craniofacial features. These cells are particularly remarkable in that they are characteristically multipotent and migratory, allowing for a wide range of tissue derivatives. While the combinatorial control of multiple signaling pathways during the early stages of vertebrate development is responsible for inducing a prospective NC fate, the cell-cell interactions mediated by surface proteins are essential for supporting the dynamic properties of the NC population. In particular, targets of the Eph subfamily of signaling molecules are responsible for activating structural rearrangements in response to various stimuli, which result in changes in cell morphology and migration. We hypothesize that, in addition to the maintenance of the cell population, the intracellular signaling cascades promoted by Eph receptor-Ephrin interaction plays a significant role in NC induction. To test this, we used an in vitro differentiation model inducing human pluripotent stem cells into NC. Following treatment with Lithocholic Acid (LCA), a known inhibitor of Ephrin-A and Ephrin-B class ligands to their respective receptors, we present that induction rates were effectively reduced as noted by the expression of known NC markers. Furthermore, prolonged treatment of cells prior to induction, as well as sustained treatment with LCA, support previous reports that cite morphological differences and reduced proliferative capability when compared to control models. These findings indicate that surface protein interactions play a critical role in the induction of NC.

Michael Baird, Chemistry  
Faculty Mentor: Dr. Jack Eichler, Chemistry  
Synthesis of Copper(II) Coordination Complexes with Antitumor Activity

Glioblastoma is the most commonly occurring brain cancer, with over 100,000 new cases per year, worldwide. There is no known cure for this deadly cancer. Chemotherapeutics such as Cisplatin (cisdiaminedichloroplatinum(II)) have numerous side effects, motivating research for drugs based on other transition metals, including copper(II). The results of Inci et al indicated that bis polypyridyl copper(II) complexes may have enhanced cytotoxicity over mono complexes. In an effort to expand the library of copper(II) based anticancer drugs, bis complexes containing bipyridine (bipy) derivatives have been synthesized. All reactions were completed by adding equivalents of a bipy derivative to a copper(II) ion. \([4,4'\text{dimethylbipy}]_2\text{Cu(NO}_3\text{)}_2\) and \([6,6'\text{dimethylbipy}]_2\text{Cu(NO}_3\text{)}_2\) were made by reacting \(\text{Cu(NO}_3\text{)}_2*2.5\text{H}_2\text{O}\) with two equivalents of ligand in methanol at 50°C. X-ray crystallography and elemental analysis indicate that a pure product formed from both reactions. \([6,6'\text{dimethylbipy}]_2\text{CuCl}_2\) was made by reacting \([6,6'\text{dimethylbipy}]_2\text{CuCl}_2\) with AgBF\(_4\) and one equivalent of 6,6'dimethylbipy in acetonitrile at 50°C. \([4,4'\text{dimethylbipy}]_2\text{CuCl}_2\text{CuCl}(4,4'\text{dimethylbipy})\) was made by reacting \((4,4'\text{dimethylbipy})\text{CuCl}_2\) and 4,4’ dimethylbipy in acetonitrile at 50°C. Likewise, these compounds are confirmed by X-ray crystallography, although elemental analysis indicates impurity. The presence of an additional ligand on the reported bis complexes was predicted to stabilize the interaction between the complex and DNA and enhance the cytotoxicity of these bis complexes. Sulforhodamine B (SRB) assays with GL261 glioblastoma cells showed that one of the bis complexes, \([4,4'\text{dimethylbipy}]_2\text{Cu}[\text{NO}_3\text{]}_2\), inhibited cell growth better than its corresponding mono complex. \([6,6'\text{dimethylbipy}]_2\text{Cu}[\text{NO}_3\text{]}_2\), on the other hand, did not inhibit cell growth better than its corresponding mono complex.
Barsam Barsamian, Neuroscience; Christopher Nishioka, Neuroscience
Faculty Mentor: Dr. Shu-Wei (Richard) Sun, Cellular Biology and Neuroscience
Assessment of Microstructural Changes in Human Brains Affected by Alzheimer’s Disease Using Diffusion Tensor Imaging (DTI) and Single Shell Neurite Orientation Dispersion and Density Imaging (NODDI)

Alzheimer’s disease (AD) is a neurodegenerative disease and the most common cause of dementia. AD is pathologically characterized by build-up of beta-amyloid plaques, neurofibrillary tangles and progressive white and grey matter degeneration within the brain. Quantification and assessment of the white matter degeneration may serve as a potential biomarker for developing AD. Diffusion Tensor Imaging (DTI) is a common technique used for the quantification of white matter damage within the brain. In our study, along with DTI, a new diffusion model was utilized, Neurite Orientation Dispersion and Density Imaging (NODDI). A novel difference between the two models is that NODDI allows for the estimation of an orientation dispersion index (ODI), which quantifies angular variation of neurite orientation, without a tensor. In this study, we tested whether ODI was more efficient in detecting white matter abnormalities in an AD brain compared with DTI. To test this, we ran both protocols on the same brains using Tract Based Spatial Statistics (TBSS) and compared differences in the amount of white matter abnormalities detected. Our results showed that although both models detected white matter abnormalities in the same regions of the brain, the white matter abnormalities detected by DTI were more extensive.

Gloria Bartolo, Bioengineering; Chitra Hariharan, Michael Xiong
Faculty Mentor: Dr. Jiayu Liao, Bioengineering
High Throughput Measuring of Cells Undergoing Autophagy using FRET

Autophagy, one of many types of programmed cell death (PCD), occurs when a cell degrades itself for energy during times of starvation. Screening for cells undergoing autophagy elicits value because under abnormal cell conditions, autophagy is significantly activated by tumor cells in cancer. Thus, we created a protein biosensor with the capacity of detecting autophagic cells using Förster Resonance Energy Transfer (FRET) technology. The reporter gene for the biosensor encodes two major autophagy sequences, deemed GATE16 and LC3B, as well as the sensitive fluorescent pair, CyPet and YPet. By engineering the autophagy biosensor to exhibit CyPet and YPet on opposite ends, the activity of the biosensor can be analyzed by measuring the intensity of the emitted energy of the fluorescent proteins. The protease for LC3B and GATE16, Atg4B, cleaves its substrates, splitting the biosensor and resulting in a loss of FRET signal. Therefore, autophagic cells exhibit no FRET, while healthy cells do. Our biosensor yields a more sensitive screening for autophagic PCD activity for both in vitro and in vivo studies.
John Berba, Political Science International Affairs  
Faculty Mentor: Dr. Richard Arnott, Economics  
*Booms and Busts: The Impact and Implications of Water on the Development of Perris*

This project focuses on the history and impact of water supply on the agriculture and consequently the economy of Perris in the late 19th century and through the 20th century to gain greater insight towards the significance of water in California’s history. Several water developments were examined, such as irrigation via the ambitious Bear Valley Dam and Reservoir, the transitions to the usage of underground water via the installation of wells and pumps, and the creation of the East Municipal Water District, which sourced water from the Colorado River. The project also examines the impacts of setbacks to Perris’ water supply, including the failure of the Bear Valley Dam and Reservoir, the siphoning of Perris Valley’s underground water via the Temescal Water Company, and the water seepage resulting from the San Jacinto Tunnel. From the research, it can be concluded that water was instrumental to the economic development of Perris, and that the initial loss of water in the city’s formative years may have had the greatest impact on its growth. The project employed whatever documents were available, including numerous primary sources such as period newspapers, property records, and photographs. Information was also collected from books and articles written by local historians, along with the collaboration of the Perris Valley Historical Museum. The project contributes to a deeper look at a facet of Perris’ rich but obscure history. From a research standpoint, the project highlights the importance of preserving history, and perhaps the evanescent nature of information and knowledge.

Damini Bhana, Chemical Engineering; Eric Lin; Jesse Mendoza  
Faculty Mentor: Dr. Kawai Tam, Chemical and Environmental Engineering  
*Titania Coatings*

Air pollution is a serious global concern that has negative implications in many facets of society, including human health, infrastructure integrity, and regulatory costs. NOx is a particularly devastating pollutant and is a precursor to other pollutants and environmental impacts such as ozone, particulate matter, acid rain, and photochemical smog. This harmful chemical is derived mostly from anthropogenic sources such as vehicle exhaust and industrial processes causing significant detrimental impacts to both the environment and human health. Titania Coatings aims to combat NOx pollution through the development of a photocatalytic NOx reducing roof coating. The reaction is catalyzed by sunlight, which activates the titanium dioxide in the coating, producing hydroxyl radicals. These hydroxyl radicals react with NOx, oxidizing the harmful pollutant to nitrates. Although the reaction is converting NOx to nitrates, the levels at which nitrates are produced do not pose environmental threats or impact human health. Through a series of atmospheric chamber experiments at the Center for Environmental Research & Technology, the Titania Coatings research team has developed an optimal coating in terms of effectiveness, safety, and cost. Overall, this photocatalytic roof coating removes NOx from the atmosphere, purifying the air and creating a cleaner atmosphere.
Jonah Bodden, Plant Biology; Dr. Jenny Hazlehurst, Entomology; Dr. Quinn McFrederick, Entomology; Dr. Chris Clark
Faculty Mentor: Dr. Erin Rankin, Entomology

Mechanical Transmission of Pollinator and Plant Pathogens via Insect Pollinators

Understanding the foraging behavior of different flower pollinators is essential to studying how insect-transmitted pathogens travel from one organism to another. Helminth parasites, such as tapeworms, often use insects as intermediate hosts for their developing eggs. Insects infected with helminth eggs will eventually shed developing helminth larvae in their feces. An insect that ingests infected feces could become an intermediate host for the parasitic larva. While there is some work examining this consumption-based mode of transmission, there is a large gap in our knowledge as to how pollinators moving between and among flowers may contribute to helminth transmission. We hypothesize that insect pollinators may act as mechanical vectors for pollinator and plant pathogen transmission, including pollinator parasites such as tapeworms and nematodes. Specifically, we hypothesized that bumblebees and ants may spread pathogens to plants and other pollinators by excreting infected feces directly onto flower parts, or by walking through infected feces and mechanically spreading the pathogen on flower parts. The foraging behavior of bees and ants was observed with special attention paid to where on the flower the insects (a) walked and (b) deposited feces. This was accomplished by feeding the insects a fluorescent dye of one color, then having the insects walk through a fluorescent dye of another color, and lastly presenting the insects with dye-free potted plants on which to forage. After the insects visited a flower, the flower would be examined under ultraviolet light to observe the insects’ footprints and any feces left on the flower. Measurements were taken of insect footprints per unit area on different floral regions and of percentage flower cover of feces. The results of this experiment could provide insight into the exact location and mechanism of pathogen transmission to pollinators visiting the flower, as well as the frequency with which pollinators may come into contact with pathogens distributed mechanically by other pollinators.

Jaime E. Brito, Biology
Faculty Mentor: Dr. Byron D. Ford, Biomedical Sciences

Anti-Inflammatory and Neuroprotective Properties of Neuregulin-1 Following Ischemic Stroke in Rats

Stroke is the third leading cause of death in the United States and approximately 800,000 people will suffer from a stroke annually. A stroke is characterized by a lack of blood flow to the brain due to a blood clot or a disrupted blood vessel. Failure of proper blood flow to the brain results in depletion of cerebral oxygen that leads to concentrated neuronal damage within the infarct area. Several studies have shown that cell damage caused by stroke is intensified by inflammatory responses that are mediated by cells undergoing apoptosis. Furthermore, anti-inflammatory mechanisms have become a key target for therapeutic strategies in neuroprotection following a stroke. However, many clinical trials for stroke therapy have proven ineffective and have limited treatment options. My lab focused on identifying the mechanisms underlying the pathophysiology of neurodegeneration and neuroinflammation following stroke. To this end, we use a rat model of stroke to examine compounds involved in immune response regulation. Specifically we are researching the role of Neuregulin-1 (NRG-1) as a novel candidate for future stroke treatment. Our data showed that NRG-1 was capable of displaying anti-inflammatory properties and have implications for the suppression of neuronal cell death. In this study, we examined the neuroprotective qualities of NRG-1 using transient and permanent middle cerebral artery occlusion rat stroke models. Immunohistological techniques were performed on brain sections after stroke and NRG-1 treatment for microscopic analysis. Our data indicates that a downregulated inflammatory response of stroke-induced target proteins/genes by neuregulin may have critical function in protecting brain cells from stroke.
Alysia E. Burbidge, Psychology  
Faculty Mentor: Dr. Jon A. Willits, Psychology  
Analyzing Number Word Usage to Understand Number Concept Acquisition in Young Children

The manner and frequency of number word usage when speaking to children may play an important role in their acquisition of number concepts, but we know little about how number words are actually used in speech to children. To address this, we gathered data from the CHILDES database (transcribed speech to children) and performed analyses on three number word statistics: 1) lexical frequency, 2) lexical diversity (i.e. the proportion of words with which number words are used), and 3) contextual usage diversity (i.e. the situations in which number words are used). The purpose was to see if these statistics might reveal why some aspects of number concept acquisition are easier than others. We found that there are important differences in how small and large number words are used (such as differences in frequency or contextual usage frequency). Additionally, there seems to be general positive and negative trends for various types of number-word usage contexts as children mature. Numbers are used for counting much more frequently than other number word contexts toward children between the ages of zero and one, but then begins to decline, as the children grow older, whereas the frequency of the quantification of objects tends to increase with age. Documenting these trends is helpful in determining the most helpful contexts to use when teaching children about the properties and uses of numbers.

Abigail Burr, Microbiology; Hashini Batugedara, Microbiology  
Faculty Mentor: Dr. Meera Nair, Biomedical Sciences  
RELMα Proteins from Chronic Lung Damage Caused by Parasitic Hookworm Infection

Helminth infections afflict an estimated 1.5 billion people worldwide. Once within the host, helminths such as hookworms, first burrow through the lung prior to migrating to the intestine. Though colonization of the lungs is short (24-48 hours post infection), the damage associated with this migration is severe and long lasting. Therefore, it is important to investigate the lung pathogenesis induced by hookworm infection. Resistin-like molecule α (RELMα) is a mouse-derived molecule that is highly upregulated following infection with the hookworm Nippostrongylus brasiliensis (Nb). Previous studies demonstrated RELMα KO mice (RELMα−/−) were able clear worms faster, however these mice suffered from increased acute lung inflammation. However, the role of RELMα in chronic inflammation induced by Nb infection has yet to be understood. In this study, we investigated the role of RELMα and Nb infection-induced chronic lung inflammation (>30 days post infection). By performing histological staining and pathology scoring of day 30 Nb infected lung tissue, we observed that inflammation caused by Nb migration leads to increased airway thickening, infiltrating leukocytes, and alveolar destruction compared to naïve mice. Furthermore, we discovered that the absence of RELMα did not affect airway thickening and infiltrating leukocytes but made a significant difference in alveolar destruction, which is characteristic of emphysema, a pathologic consequence of several chronic lung inflammatory diseases. Together, these results show that hookworm infection causes chronic damage of the lungs that can be ameliorated by RELMα.
Menthol is a popular flavoring in cigarettes and electronic cigarettes. However, it not only is a flavor additive, menthol overrides the harsh taste of tobacco and alleviates nicotine’s irritating effects. Menthol is the only flavoring in cigarettes not regulated by the FDA, which allows menthol products to be sold in high concentrations. Transient receptor potential subfamily M member 8 (TRPM8) is a calcium ion channel that is activated by menthol. We hypothesized these receptors are present in the human lung and their activation results in excess calcium influx that leads to an increase in reactive oxygen species (ROS) that in turn cause cell damage. In this study, human lung epithelial cells (Beas2B) were exposed to various concentrations of menthol in an air-liquid interface system to determine the cytotoxic effects of menthol. Using the Vitrocell exposure system, cells in transwell inserts were exposed to puffs of menthol generated by a nebulizer. The TRPM8 receptor was demonstrated in Beas2B cells by immunofluorescence and western blotting. To verify increased calcium influx, cells were transfected using a genetically encoded calcium indicator plasmid and treated with menthol. The expression of superoxide, a form of ROS, was analyzed using MitoSOX dye, and the enzyme responsible for counteracting superoxide, superoxide dismutase (SOD-2), was analyzed using western blotting. Menthol exposure significantly increased calcium influx and induced an increase in the expression of superoxide and SOD-2. Data showed that menthol exposure at an air-liquid interface causes oxidative stress in lung epithelial cells, likely through activation of the TRPM8 receptor.

During childhood, children are expected to learn how to appropriately regulate their anger. The goal of this project was to explore how emotion regulation strategy repertoire for anger relates to overt hostility (a sign of dysregulated anger) in childhood. We explored age, sex, and stress physiology as potential moderators of this effect. One hundred eighty-four (184) children (3-11 years; M = 7.67; SD = 2.30; 49.2% girls) participated. Parents reported on their children’s overt hostility, and children’s resting physiology was measured. Children were asked to recall an event that made them feel angry and describe what they had done to make themselves feel better. These answers were coded for specific emotion regulation strategies, and the number of different strategies was summed to create a repertoire measure. We ran a hierarchical regression to assess whether anger regulation repertoire, resting physiology, age, and sex were associated with levels of overt hostility. Boys showed more overt hostility, \( b = -.107, t = -2.165, p = .032 \). Lower resting RSA was associated with more hostility \( (b = -.045, t = -2.044, p = .043) \). Finally, having a smaller repertoire was associated with more hostility \( (b = -.072, t = -2.478, p = .014) \). The interaction of age and anger repertoire was marginal \( b = -.024, t = -1.882, p = .062 \); a smaller repertoire was associated with more hostility for older children. Results suggest that children’s ER repertoire for anger was important in understanding levels of overt hostility.
Tuong Cao, Biochemistry
Faculty Mentor: Dr. Martin Garcia-Castro, Biomedical Science

Characterize Role of Pax3/Pax7 in Neural Crest Specification using Mouse Model

Neural Crest (NC) is an embryonic stem cell population that migrates throughout the embryonic body plan to give rise to a wide array of ectodermal and mesenchymal derivatives such as peripheral nervous system, melanocytes, smooth muscle and craniofacial bone and cartilage. Impairment in NC development is associated with several birth defects such as cleft palate as well as cancers such as melanoma and neuroblastoma. It has been demonstrated in chick embryos that the NC is specified during early gastrulation marked by expression of Pax7, an early NC marker. In chick embryos, Pax7 was also shown to be required for the specification of NC. Several studies in mammalian model systems have also associated the loss of Pax7 and its paralog, Pax3, with NC associated birth defects such as cleft lip. In mammalian system, Pax7 has been described as the earliest NC marker; however, the role of Pax7 and Pax3 during NC specification has not been determined. To better understand the pathological significance of Pax3/7 associated NC defects, it is essential to analyze their role during formation of NC. We performed a comparative immunohistological analysis between the wild type and hetero and homozygous knockouts of Pax3/7 mouse embryos to determine the role of Pax3 and Pax7 in NC formation. In these knockout embryos, we analyzed the expression of NC specific markers, Sox 9, Sox 10, AP2, MSX 1/2, Pax2, Pax3, Pax6 and Pax7 to define the role of Pax3/7 in mammalian NC formation.

Jocelyn Carballo, Chemistry; Sabrina Sedano, Luis Jimenez
Faculty Mentor: Dr. Wenwan Zhong, Chemistry

The Application of Silica and Metal Oxide Microfibers for Nucleic Acid Extractions

The biological method of the fabrication of silica microfibers for nucleic acid extraction is an important approach in the diagnosis of diseases as well as DNA and RNA research. Although commercially available silica coated iron oxide beads have the ability to extract DNA to as low as 1 fmol, silica microfibers would be a better option. Due to their larger surface area, silica microfibers are more effective in extracting DNA and are more inexpensive to produce than the silica beads. In this research, silica microfibers were produced via the sol-gel electrospinning method. Tetraethyl orthosilicate (TEOS), a precursor of silica, was first treated with acid to produce silica, and then polyvinyl alcohol (PVA), an easily electrospun polymer, was added before electrospinning to increase the entanglements. These fibers were then used for DNA extraction in tube. By quantifying extracted DNA through qPCR, it indicated that microfibers had higher recovery compared to commercial silica column methods. We were also able to produce modified silica fibers and modified buffers that are able to recover more DNA than the original silica microfibers that were previously made and compared to commercial columns. By using silica fibers in nucleic acid extraction, it can be a more efficient and affordable technique that can be applied to the detection of nucleic acid biomarkers of various diseases and provide a faster extraction method for biological and medical research.
Mayra Ceballos, Sociology  
Faculty Mentor: Dr. Ellen Reese, Sociology  
*Education or Training: Factors Shaping the Implementation of Welfare-to-Work Requirements in San Bernardino and Riverside Counties*

My research focuses on CalWORKs recipients in the San Bernardino and Riverside Counties and their experiences with welfare-to-work programs. The focus of the research will be the factors and characteristics that determine which welfare-to-work recipients attend higher education (e.g., community college and/or four-year colleges or universities), and which ones enter the work force and/or receive vocational training instead. Drawing theoretical insights from Patricia Hill Collins and intersectional feminist theory, I explore how welfare-to-work participants’ experiences vary depending upon their social locations and their biographical history. In addition, using Lipsky’s concept of “street level bureaucrats,” I explore the potential role that caseworkers have in encouraging or discouraging welfare-to-work participants to pursue higher education and/or vocational training. Using in depth interviews with CalWORKs recipients’ I will gather information related to, case workers’ interactions with recipients and, recipients’ age, gender, race, parents’ legal status, marital status, number and ages of children. In addition, my interviews explore the potential role of the impacts of peer mentors, and family in shaping welfare-to-work participants’ experiences.

Vanessa Ceja, Psychology/Anthropology; Valery Franco, Maria Isabel Gutierrez, Kevin Rodriguez  
Faculty Mentor: Dr. Venugopala Gonehal, Botany and Plant Sciences  
*An Arabidopsis Coregulator Functions with WUSCHEL in Mediating CLAVATA3 Expression and Stem Cell Homeostasis*

A coregulator has been characterized to function with the WUSCHEL (WUS) protein to maintain CLAVATA3 (CLV3) and stem cell homeostasis. The low levels of WUS, activating (CLV3), with the repressive function of the coregulator forming a lateral and deeper tissue boundary determine the domain of CLV3 expression in the central zone (CZ). Coregulator exclusion from the CZ is theorized to allow for WUS mediated activation of CLV3. However, there are three challenging observations: 1) A WUS protein version without a coregulator binding domain is able to maintain stem cells. 2) The deletion of WUS binding sites within the critical CLV3-cis-regulatory module (CRM) led to misexpression of CLV3 in the deeper layers of the shoot apical Meristem (SAM) where the coregulator proteins are found. 3) Modifying WUS binding affinity or increasing its concentration in the outer layers is sufficient to produce CLV3 repression where the coregulator is not found. Our goal is to determine the molecular function of these coregulator proteins, which can influence either WUS protein levels or DNA-binding. We will follow WUS protein levels and domains of WUS transcription by introducing relevant reporters into the coregulator mutant background. To determine the role of these coregulators in competitive binding against WUS binding sites in CLV3-CRM, we will test them in DNA-Protein binding assays to measure their DNA binding ability in the absence and presence of WUS. To determine if this cofactor protein will enhance WUS DNA binding ability, assays at varying cofactor concentrations will be used to measure WUS-DNA binding.
Jacqueline Cely, Cell, Molecular, and Developmental Biology; Gus Gómez, Alan Leung  
Faculty Mentor: Dr. Martín García-Castro, Biomedical Sciences  
Expression Profile of Novel Candidates in Neural Crest Development

The neural crest (NC) is a cell population in developing vertebrate embryos that migrate extensively and differentiate into various cell types. Abnormal NC development can lead to neurocristopathies such as cleft lip and DiGeorge syndrome. Few genes associated with NC development have been identified and remain the subject of intense research for their possible clinical use. Our recent work with a human NC induction model suggests putative novel genes involved in NC development. We hypothesize that these genes will be expressed in NC during development and that their expression should be conserved in other organisms. To first validate these putative genes, their expression should correspond to NC development. The purpose of this investigation was to characterize the expression patterns of the candidate genes in the model organism, *gallus*. Whole mount *in situ* hybridization (ISH) was utilized to monitor the expression profile of candidate genes *Anxa1, Axin2, Cntn2, Col9a2, Cpe, Fbln7 Lgi1, Lypd1, Lmo1, Mmnr1, Plag1, Tmem132c*, and *Tnfrsf19*, along with a known control, *Sox9*, in early chick embryo stages. Antisense mRNA probes were created, labeled with a nucleotide mixture of uridine triphosphate (UTP) conjugated with digoxigenin, and hybridized to chick embryo mRNAs. The results suggest that *Axin2, Lmo1, Plag1, Tmem132C, and Col9A2* are expressed in key spatiotemporal patterns to further support their putative role in NC development. Currently, the conservation of the candidate gene expression is being monitored through qPCR using induced pluripotent stem cells. Future work will investigate the genes’ possible function through gain- and loss-of function approaches.

Stephen Chau, Psychology; Parisa Parsafar  
Faculty Mentor: Dr. Elizabeth L. Davis, Psychology  
Mindfulness Meditation Attenuates Gender Differences in Emotional Reactivity/Responding

Previous research suggests there are gender differences in emotional expression and responding (Timmers et al., 1998). Mindfulness meditation (MM) helps improve in-the-moment awareness of thoughts, feelings, and sensations and is associated with enhanced emotional awareness. We examined whether MM might influence: 1) associations among different aspects of emotional responding (e.g., subjective intensity and emotional expression) and 2) gender differences in emotional responding among these different indices. Two hundred twenty five college students from UCR (38% men) were randomly assigned to listen to either a 25-minute mindfulness meditation (MM) or a comparison audio track. They then watched either a sadness or anger-eliciting three-minute film clip and self-reported the intensity of negative emotion (sadness, anger) immediately after. Participants’ negative affect (facial/behavioral distress intensity) while they watched the film clip was coded offline. MM condition: there were no associations between gender and intensity of negative affect or gender and self-reports of sadness or anger emotional intensity. CC condition: gender was related to reports of sadness intensity, $r = .207$, $p = .037$, anger intensity, $r = .255$, $p = .010$ and (marginally) negative affect, $r = .178$, $p = .086$ with women reporting greater emotional reactivity/responding across all indices. Previous work demonstrated that meditators report a greater sense of emotional control and clarity and experience lower levels of arousal (Nielsen & Kaszniak, 2006). For our study, MM may either have increased men’s awareness and reports of emotion, or attenuated women’s emotional responding, thus evening out emotional responding across genders.
Joana Chavez, Ethnic Studies and Spanish (Cultural Studies)
Faculty Mentor: Dr. Jennifer Najera, Ethnic Studies
Creating Freedom from Within: Young Women of Color in Group Homes

Conversations around youth criminality often ignore young women of color, or do not see them as important. Throughout the twenty first century, the juvenile system has placed “troubled” young women in “home” environments that are correctional institutions. As I worked in a group-home placement facility for young women, I witnessed young women disciplined into obedience and social norms. Adolescent women are continuously criminalized, judged, and forced to be lady-like. Without question of how gender norms have been historically constructed, an implication of normalized femininity is strongly imposed by the correctional system. In this paper, I discuss qualitative interviews with former Latinas at the group home where I was employed. They share their experiences and the regulations that made them feel like prisoners in placement. I argue that their “fuck that” attitude reflects the desire to be “libre” -- creating freedom from within since they are not able to feel while being in the group home. This paper advocates for more training, culture sensitivity, and research on why youth are labeled criminal through laws and policies for staff. Further, an abolitionist perspective can help us question the underlying violent, gendered, and racist normative ideologies that inform criminal policy to advocate for critical education as opposed to correctional institutions. The demolishment of society’s racist and sexist ideologies can help ensure a brighter future for the young women who leave residential programs, and future generations who break and question normative gender standards.

Hourng Kim Chea, Chemical Engineering; Thomas Dugger, Sandra Correa-Garhwal
Faculty Mentor: Dr. David Kisailus, Chemical and Environmental Engineering
D. Triton Waterproof Egg Sac

Unlike most spiders, female Dolomedes triton create a waterproof, but well ventilated protective silk egg sac. They accomplish this by glazing the egg sac with a brown waterproof coating. By determining the coating’s molecular composition and how it functions, we can apply Nature’s design to make biomimetic waterproof and breathable materials. To show the hydrophobicity of the egg sac, we compared the contact angle of known hydrophobic material with the contact angle of the egg sac. We compared egg sac hydrophobicity between D. triton and Latrodectus geometricus, a species without a coated egg sac, by briefly submerging the egg sacs in water and weighing them while simultaneously allowing water to evaporate. To determine the chemical composition of the coating, we tried physically separating the silk and coating, and then applying different chemical treatments; however, the coating was resistant to most of the treatments. We utilized mass spectrometry, FTIR, and NMR on coated and uncoated D. triton egg sac silk to determine chemical structure and composition.

Justin Chen, Biochemistry; Zuivanna M. Rivas, School of Medicine
Faculty Mentor: Dr. David Lo, Biomedical Sciences
Behavioral Changes of Macrophages and Neutrophils During Biofilm Induction

Staphylococcus aureus is a well-known pathogen, notable for its frequent biofilm formation on indwelling medical devices and its ability to evade host innate immune cells. Using different S. aureus UAMS-1 bacterial strains to infect PGRP-dsRed/CX3CR1-EGFP double transgenic mice, we observe the potential changes in behavior of macrophages and neutrophils during the induction of biofilm. We have visually identified neutrophil aggregates in infected tissues by means of two-photon imaging. Additionally, calculations for velocity, displacement, and meandering have been conducted, suggesting variance between the infected and the non-infected models. These results propose that neutrophils act accordingly in the presence of S. aureus infection and introduce a connection between the aggregates and behavior.
Using Linguistic Analyses to Predict Positive and Negative Schizophrenia Symptoms

Our project investigated whether word-use by patients with schizophrenia predicted symptom severity. Patients were interviewed with a set of questions (such as telling their life story). We used a program called Linguistic Inquiry and Word Count (LIWC) to generate scores on various parameters of word-use for each patient’s interview responses. Patients’ symptom severity was measured in a clinical session using the Positive and Negative Syndrome Scale (PANSS). The PANSS collects measurements of various positive symptoms (additional atypical behaviors), negative symptoms (absent typical behaviors) of schizophrenia and general psychopathology. Correlational analyses was performed on patients’ PANSS and LIWC data to see if we could predict PANSS dimensions with LIWC dimensions. Several correlations were found. Positive symptom scores were positively correlated with use of perceptual words. For example, hallucinations, a positive symptom, can be thought of as an excess of perceptual activity. Those patients with higher positive symptom scores tended to talk about their perceptual experiences more. Negative symptom scores were predictable by parameters indicating length of response. The higher they scored on the negative dimension, the shorter the patients’ responses were to prompts. Patients’ hostility score on the PANSS were positively correlated with their use of aggressive words. Lastly, there was a negative correlation between patients’ disorganized thought dimension (DisOr), a positive symptom, and their LIWC analytic dimension. The higher their DisOr, the less logically their responses were structured. Our project demonstrates the ability of linguistic analysis to predict schizophrenic symptoms and may lead to future avenues regarding diagnosis.

Planarity in Microfluidic Netlists

This paper proposes a new method that is capable of taking non-planar microfluidic netlists, and through minimal switch insertion makes that netlist planar. Graph planarity is required by most microfluidic placement and routing algorithm, and the ability to add fewer switches with minimal loss of distinctive routes decreases placement and routing complexity while keeping application complexity low. By extracting Kuratowski subgraphs from non-planar netlists, breaking and adding a minimal number of switches and intersecting a minimal number of edges to make those subgraphs planar. The developed algorithm allows us to enforce planarity on the larger netlist.
Mammalian mothers allocate nutrients into their breastmilk throughout their lactation period. This nutrient allocation, which is one of the main components of maternal care, can be costly to the mother and is likely to change across the lactation period as the infants develop. As a monogamous and bi-parental rodent, the California mouse (*Peromyscus californicus*) is a useful model for studying parental investment in mothers that share the cost of parental care with their mates. However, nothing is known about lactation in this species. We investigated two possible influences on milk composition in California mouse mothers: stage of the lactation period and parity (i.e., number of previous litters raised). Mothers with low (4-5 litters) and high parity (9+ litters), were milked at three different time points during the 27- to 30-day lactation period; days 7, 14 and 21 postpartum (i.e., early, mid, and late lactation, respectively). Milk samples were analyzed for fat, water, and protein content. Results will improve our understanding of differences in milk composition, both within and between individual mothers, and will lay the foundation for future studies of maternal investment in this monogamous, bi-parental mammal.

Mitotic rounding is critical in the process of mitosis because it ensures the proper distribution of chromosomes to the two daughter cells. The regulation of cytoplasmic pressure drives the expansion of the apical area of epithelial cells during mitotic rounding. We study this process using a subcellular element model, in which the structure of cells is composed of cytoplasm and membrane nodes that allow for the natural fluidity and physical characteristics of cells. While the current model is sufficiently accurate because it is calibrated using experimental data, a reluctance in the computational biology community is the overwhelming degrees of freedom that the model introduces. With respect to cytoplasmic pressure, the model uses two Morse potential energy functions to approximate the subcellular nodal force interactions between the cytoplasm and membrane. Our goal is to reduce the number of parameters so that we are left with one energy function describing the entirety of the cytoplasmic pressure. We plan to study how each of the parameters in the Morse Potential function affects the size and shape of cells. Since the model works only within a certain range of viable potential energies, by graphing the equation and manipulating the variables we hope to discover a set of parameters that accurately models the cytoplasmic pressure of the cell. This is important because reducing the model’s degrees of freedom is vital for tight calibration of the numerical model with experimental data.
Sheri Chu, Psychology; Colby See, Fabian Gonzalez  
**Faculty Mentor: Dr. Connie Nugent, Cell Biology and Neuroscience**  
*Construction of a ten1 Mutant Strain and Investigation of DNA Damage Localization in the Model Saccharomyces Cerevisiae*

The linear ends of chromosomes, referred to as telomeres, are maintained and protected from degradation by several different proteins. Three of these proteins form a complex called CST (CDC13, STN1, and TEN1). For a while, members of CST were thought to only function at telomeric regions of chromosomes. However, previous research in the lab shows that truncation of the Stn1 protein results in non-telomeric DNA damage. This result suggests that STN1 may function at genomic regions outside of telomeres to maintain genomic integrity and prevent spontaneous DNA damage. Since there are three members of CST, it is crucial to understand if CDC13 and TEN1 function similarly. The goal of this project is to look at DNA damage in Saccharomyces cerevisiae cells with a mutant form of TEN1. A yeast strain in the ten1 background was constructed with two genes that produce fluorescently tagged proteins: RAP1, producing a protein product that associates at telomeres, and RAD52, producing a protein that functions at sites of DNA damage. This approach will allow us to determine if Rad52 DNA damage foci are observed at regions that do not co-localize with Rap1 at telomeres. A second strain including a potential suppressor mutation in the gene MCM4 was also constructed. The experiment will examine the co-localization of the fluorescent proteins in normal and DNA damaging conditions. These results should provide information on whether Ten1 functions with Stn1 in preventing DNA damage accumulation outside of telomeres and if mcm4 has an effect on damage accumulation.

Victoria Ciudad-Real, Global Studies and Public Policy  
**Faculty Mentor: Dr. Jade S. Sasser, Gender and Sexuality Studies**  
*Understanding UC Riverside's U-PASS Program and Student Ridership*

The purpose of this research is to evaluate UC Riverside's U-PASS Program. U-PASS is UCR’s version of an Unlimited Access program, an increasingly popular partnership adopted between universities and transit agencies to increase ridership and service. At UC Riverside, the U-PASS program is a free public transportation service provided to all UCR ID cardholders through the Riverside Transit Agency (RTA). While studies have shown that U-PASS programs are successful in increasing student ridership, mobility, and decreasing parking demand, few have focused on the quality of service, utility, change in travel behavior or travel experience of students while using the program.

My research questions are the following: How do UCR students feel about U-PASS program and RTA’s current services? Are particular UCR students more or less likely to use the U-PASS program? How can expanding RTA’s quality and services improve the quality of life for UCR’s uniquely large commuter student population through its U-PASS program? The project consists of an online survey and in person focus groups with UCR undergraduate students. This project seeks to bridge an informational gap between the school’s administration and students to decrease barriers of entry into the U-PASS program and increase service quality, access, student mobility and overall ridership.
Mirella Deniz-Zaragoza, Sociology
Faculty Mentor: Dr. Ellen Reese, Sociology
A Family of Unequals: The Lived Experiences and Consciousness of Farmworkers

My research paper examines how the reproduction of workplace inequalities influences farmworkers’ daily life decisions, as well as their understanding of themselves and the world that surrounds them. My research is based on a case study of migrant farmworkers in the Coachella Valley. Through in-depth interviews with workers and ethnographic research in a farm working community, I will demonstrate how exploitative labor practices have become normalized under restrictive immigration laws and neoliberalism. In addition, I will also explore how historical relationships of race and ethnic relations in the United States are expressed within farm working environments. I argue that extreme levels of labor exploitation and domination are driven by the need of growers to retain existing profit margins, and that they do this at the expense of the health and well-being of workers. I investigate how workplace hierarchies become essential to communications between employers and employees, work practices, and family relationships. My research will provide a nuanced understanding of how injustice operates as a functional necessity within the contemporary agricultural industry in the United States, as well as the human cost of doing business within this industry for people located at different positions in the flow of work and life. Farmworkers have become desensitized to their own exploitation because, at the end of every day, their backbreaking labor allows them to provide a plate of food for their families. Farmworkers have also become very segregated by race and ethnicities, which contributes to the reproduction of inequalities amongst themselves.

Tony E. Dorado, Chemistry; Xin Lee
Faculty Mentor: Dr. Ming Lee Tang, Chemistry
Covalent Organic Frameworks for the Upconversion of Photons with Nanocrystal Light Absorbers

More than 50% of photons from the sun are unable to be used because they are outside the range of which current photovoltaic systems can utilize. Photons in the infrared region are too low in energy to be utilized by solar cells. The purpose of this work is to design an efficient hybrid thin film that can effectively upconvert incoherent visible and near-infrared photons originating from the sun. This will be done by using semiconductor nanocrystals to absorb low energy light and conjugated organic molecules organized in a crystalline framework to emit high-energy photons. Through a method termed triplet-triplet annihilation, two molecules in their triplet-excited state recombine to result in one molecule in the ground state while the other molecule is placed in the \( S_1 \) state. Covalent organic frameworks will be used to house the annihilator molecules because their crystalline framework and orientation on the substrate will allow directional energy transfer. Although there are several ways to create a covalent organic framework, such as hydrazone linkages and borazine ring linkages, imine linkages will be used for the covalent organic frameworks for two main reasons: they are more stable than boronate esters and the precursors are more synthetically accessible than hydrazine and borazine based covalent organic frameworks. Ultimately, this work offers the potential ability to control triplet diffusion, allowing the efficient utilization of the visible and near-infrared photons from the sun in thin film and in solution.
Kevan Elkins, Plant Biology; Alex Rajewski, Dinusha Maheepala  
Faculty Mentor: Dr. Amy Litt, Botany & Plant Sciences  
*Timing of Developmental Stages in the Fruit of Desert Tobacco*

The genetic basis for the evolutionary differentiation between fleshy fruits and dry fruits is poorly understood. To help specifically understand the development of dry fruits, we are using desert tobacco (*Nicotiana obtusifolia*), a small diploid plant in the tobacco family that easily produces abundant dry fruits. In order to study the divergence in fruit type it is necessary to determine the timing of the fruit development stages. Although the timing of these stages has been determined in many other species, it had yet to be determined for desert tobacco. Fruit development begins before anthesis (flower opening) and proceeds in four defined stages: development of the ovary, cell division in the pericarp triggered by fertilization, cell differentiation, and then final maturation. To determine the timing of these stages, we collected the ovaries/fruit from desert tobacco at each day after anthesis. We then sectioned and stained samples with fast green and Safranin O to visualize cell division in the pericarp, which is indicative of stage two, and to visualize lignification of tissue, which is indicative of stage three. Identifying common developmental stages and their timing provides us with a consistent way to sample and compare different species at similar stages of development.

Mathea Elnar, Cell, Molecular and Developmental Biology; Marisol Arellano, Neuroscience  
Faculty Mentor: Dr. David Lo, Biomedical Sciences  
*Characterizing the Structure and Formation of Organized Lymphoid Tissues in the Gut and Lung in Models of Disease and Inflammation*

Organized lymphoid tissues in the gut, called Peyer’s Patches, are areas in which luminal pathogens are detected and effective immune responses are subsequently triggered. This process is heavily aided by specialized epithelial cells, known as Microfold Cells (M cells), which perform the majority of immune surveillance in the gut. M cells accomplish this by capturing and transcytosing microparticles across their apical and basal lateral surfaces and delivering them to antigen presenting cells, such as dendritic cells, which may then trigger an immune response. Thus, organized lymphoid tissues in the gut can be characterized by the identification of these specific cell types, in addition to a plethora of other cells and structural components. Through our studies, we aim to recognize changes in the structure and formation of these organized lymphoid tissues in the guts of various transgenic mice that act as models of Crohn's Disease. In addition, we aim to use these markers to identify the appearance and formation of similar organized lymphoid structures in the airways of the lung after an intranasal administration of silica nanoparticles.
Iden Emam, Political Science  
Faculty Mentor: Dr. Jana Grittersova, Political Science  
*Discrepancy in Prices Paid to Farmers Between Ethiopia and Kenya 1990-1997*

Coffee is the second most valuable commodity traded on markets today, second only to crude oil. Global stocks of coffee are grown by a large base of farmers who struggle to earn a living wage from their crop. Today, two countries encompass the very region that provided the world with coffee, Kenya and Ethiopia. From the period between 1990-1994, both countries’ coffee farmers were earning very similar wages from their crops. However, with the 1994 coffee spike, farmers in Kenya were able to capitalize on the coffee shortage and earn on average 25.1% more wages than their Ethiopian counterparts. This paper seeks to analyze historic factors that influenced this discrepancy in wages, as well as an economic analysis of the two states. As with any region, there are vast arrays of factors and influences that have far-reaching effects. While Kenya was a British colony for much of the 20th century, Ethiopia remains unique among the African nations, as it was never colonized. This invited many spheres of influence into the nation over the years, stunting development of the region. On the other hand, Kenya benefited from the stability and investment provided by the British Empire, continuing through its post-colonial years. Despite both nations selling a near-identical product, their borders provide a very different price paid out to farmers. This paper seeks to inform of the historic background as well as pertinent economic information, which led to drastic differences in prices paid to coffee farmers during this period between Kenya and Ethiopia.

Katherine Espinoza, Neuroscience; Sonia Afroz PhD  
Faculty Mentor: Dr. Iryna Ethell, Biomedical Sciences  
*Understanding the Role of Perineuronal Nets in Developing Hippocampal Circuits in a Mouse Model of Fragile X Syndrome*

Fragile X Syndrome (FXS) is a leading cause of intellectual disability, caused by expansion of CGG repeats that leads to hypermethylation and silencing of Fragile X Mental Retardation (*Fmr1*) gene. Silencing of *Fmr1* gene results in the loss of Fragile X Mental retardation protein (FMRP), which can cause altered synaptic transmission. These deficits contribute to FXS symptoms, including cognitive and learning impairments, origin of which remains unknown. The *Fmr1* KO mice show similar learning deficits and serve as a mouse model of FXS. Abnormal development of neuronal circuits, in particular, hippocampal interneurons of *Fmr1* KO mice, may underlie learning deficits. The goal of this study is to determine cellular mechanisms underlying abnormal hippocampal development in *Fmr1* KO mouse, specifically, the development of parvalbumin (PV)-expressing inhibitory interneurons. Previous studies in *Fmr1* KO mice have demonstrated an increased level of matrix metalloproteinase-9 (MMP-9), an extracellular enzyme that cleaves extracellular matrix, including perineuronal nets (PNNs). PNNs act as scaffolds around the PV inhibitory neurons and regulate their maturation and activity. Our preliminary studies suggest that a delayed formation of PNNs may contribute to the abnormal development of PV interneurons in the hippocampus of *Fmr1* KO mice. If elevated, MMP-9 levels contribute to the phenotype, and then a genetic reduction of MMP-9 may reverse and restore the formation of PNNs and PV expression in interneurons. The results of these studies will provide a new insight into cellular and molecular mechanisms underlying development of PV cells and PNNs that can lead to learning deficits in FXS.
Natay Rosales Espitia, Mechanical Engineering; AmirHessam Aminfar, Mechanical Engineering
Faculty Mentor: Dr. Marko Princevac, Mechanical Engineering
Application of Background Oriented Schlieren Photography for Visualizing Air Convection

Visualizing flow behavior still faces a major problem because of its transparency to the naked eye. It is crucial to understand because being able to see the convective mode of heat transfer allows for predicting models on how much energy is transported. A nonintrusive imaging technique called background oriented schlieren photography (BOS) is used to achieve the visualization of transparent flows and gasses. In the BOS technique, a light box with a random noise background pattern are used to illuminate the refractive medium created by a simple conventional stove as a heat source. Since refractive medium is linearly proportional to density of the fluid, light from the background pattern diffracts from its original path, causing the background image to be seen distorted through the transparent medium then the camera captures this distortion. We use this technique to visualize a simple convective heat flow. By comparing distorted and undistorted images of the background using various optical flow algorithms, we calculated the displacement vectors. Since the displacement vectors are linearly proportional to the density gradient in the flow, we can visualize the convective flow of hot air.

Jazmine Exford, Linguistics and Spanish
Faculty Mentor: Dr. Covadonga Lamar Prieto, Hispanic Studies
Vienbenidos a San Juan: on the Distribution of Allophonic [v] for Spanish Phoneme /b/

This research investigates the pronunciation of Spanish phoneme /b/ by Spanish/English bilinguals in San Juan, Puerto Rico to determine if graphemes v and b are ever pronounced as a voiced labiodental fricative [v]. Presently, the voiced labiodental fricative, [v], is neither acknowledged as an allophone of phoneme /b/ nor a phoneme of its own in modern Spanish despite its frequent use in discourse. Additionally, there is no literature regarding the presence of labiodentals in Puerto Rican speech. Consequently, the existence of [v] is accounted to language contact and bilingualism, hypercorrectness, and archaic retention. For this study, I use the classification of labiodentals in modern Spanish by Lope Blanch (1988) and assess whether conditions surrounding language contact influence the presence of labiodentals. Native Spanish speaking college students living in San Juan with varying levels of English language proficiency were interviewed performing audio-recorded speaking tasks. Results show that labiodentals are undoubtedly produced for Spanish phoneme /b/, but are done so exclusively for orthographic v, which is comparable to other studies that claim labiodentals are an instance of contact induced change. However, labiodentals appeared independently from cognate status and English language proficiency, which weakens the claim of language contact. Ultimately, the results suggest that labiodentals are a case of hypercorrectness by the students in this study, as only orthography and speech style appeared to influence high labiodental frequency.
Aniella Fields, Religious Studies, Theatre Film and Digital Production  
Faculty Mentor: Dr. Erith Jaffe-Berg, Theatre Film and Digital Production  
*Understanding the Human Voice*

Nearly everyone has the ability to use the instrument of the human voice yet most people do not understand its capability or its significance within society. Using performance, I conducted research on the human voice through actors participating in a mockumentary scripted podcast project. By recording and directing thirteen actors on a large diaphragm condenser microphone, I was able to look at the differences in various voices in response to a script that had a variety of character types. It was these different character types that distinguished each individual character from each other, making them each unique. This individuality, which could be heard in the audio clips, and seen in the images of the audio waves, shows us that the voice is a direct reflection of the character and actor. With everyone essentially being an actor playing themselves, this tells us that our voice is an identifier of ourselves and we can identify each other based off our voices and how we speak. Listening to a voice you might be able to identify someone’s experiences or background, everyday behavior, and who they really are. Some people are aware of who they are while others are not. Being able to understand your voice and how to utilize it is essential. You must communicate your ideas and who you are to others in your everyday life with your unique voice.

Samuel James Finch, Anthropology/Classical Studies  
Faculty Mentor: Dr. Denver Graninger, History  
*Repurposing the Past: Architectural Appropriation in Post-Classical Athens*

The present study explores cultural attitudes toward the past by categorizing and analyzing architectural elements that the builders of thirteen churches in central Athens appropriated from demolished or delapidated buildings and reused in their own constructions between 565 and 1833 CE. Reused building materials, such as these, are known as *spolia* and vary in form and function, ranging from decorative sculptural reliefs and column capitals, to weathered marble slabs that hold up the churches' walls. While much attention has been paid to churches that incorporate extraordinary displays of *spolia*, this study also includes churches that are often overlooked because their facades exhibit less obvious or less ostentatious reuse. This broader approach not only generates new data regarding each of the churches in the study's sample, it also facilitates the creation of categories through which *spolia* incorporated into separate buildings might be compared beyond their single context, uncovering patterns in reuse for specific types of *spolia*. The conclusions one might argue from these patterns, depend on the lens through which the data is viewed. Namely, either through the lens of scarcity or the lens of abundance: for the level of availability assumed for any given category of *spolia* at the time of a church's construction, alters the interpretation of the cultural attitudes reflected in the representation of that category in the builders' selection of materials. Here lies the difference between envisioning opportunistic scavengers’ content with whatever scraps they could muster, and picky architects who carefully chose which pieces to reuse.
**Natalie Fischer, Biology**  
**Faculty Mentor: Dr. Hollis Woodard, Entomology**  
*Bumblebees’ Buzz Pollination: Nutritional and Energetic Mechanisms Underlying Behavior*

Buzz pollination is an ecologically relevant behavior that is required by a significant number of plant species for successful reproduction, which is crucial for ecosystem health, biodiversity, and maintenance of certain agricultural plants (i.e., tomatoes). Bumblebees are one of the few pollinators that perform this specialized behavior, in which they extract pollen from anthers by vibrating their thoracic muscles. Bees require energy to forage, and thus buzz pollination also requires energy, which is obtained from nectar (carbohydrates). Many studies have shown that buzz pollination is an innate motor routine in bumblebees. However, it is unclear how nutritional state impacts bumblebees’ buzz pollination behavior. This research examines how nutrition and energetic mechanisms influence buzz pollination behavior. I suggest that the nutritional environment impacts the energetic state of bumblebees, which in turn influences their ability to buzz pollinate. In this experiment, bumblebees were assigned to one of three different nectar diet treatments, and their buzz pollination behavior was examined through audio recordings and computational analysis. Further, the mechanistic connections relating nectar availability, energy, and buzz pollination performance were examined through ATP fluorometric assays. This project establishes mechanistic links between the nutritional environment, energetics and behavior that can be applied to other organisms to assess their ability to perform ecologically relevant behaviors.

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**Mauricio Flores, Cell, Molecular, and Developmental Biology**  
**Faculty Mentor: Dr. Hollis Woodard, Entomology; Dr. Naoki Yamanaka, Entomology**  
*Analyzing the Target of Rapamycin Signaling Pathway in Bumblebees*

Honeybees are relatively well-studied and much of their physiology is now documented and known. However, these studies have rarely been applied to other bee groups, such as bumblebees. I am interested in molecular pathways in bumblebees, mainly the Target of Rapamycin (TOR) signaling pathway. This pathway is found in many organisms, and works in conjunction with other molecular pathways in insects to regulate cell size, body size, endocytosis, and more functions. My study will be used to confirm if the TOR signaling pathway works similarly in bumblebees as it does in fruit flies. My method is one adopted from another experiment that tested TOR function in honeybees by feeding them an inhibitor of TOR (rapamycin) to measure any changes in foraging behavior. I will be using Western Blotting to measure any changes in the TOR signaling pathway function by measuring the amount of phosphorylated S6 proteins, a marker of TOR activity, after feeding bumblebees (*B. impatiens*) rapamycin. I will also be observing any feeding-related behavioral changes. I hypothesize that feeding bumblebees the TOR inhibitor will cause the inhibition of the TOR signaling pathway and downstream signaling from TOR proteins. This will prevent the phosphorylation of S6 proteins, which will be detected in my Western Blotting data. I will also be expecting a change in the rate of feeding. Results from this study will help confirm whether TOR signaling is a conserved pathway with a role in regulating feeding-related behaviors bumblebees.
Positive and negative emotions differ both in valence and in how they motivate approach-oriented behavior (e.g., a person’s willingness to take action to address a situation head on). They may also differentially influence the way information is processed. We examined whether sadness and anger, two emotions of the same negative valence but different in terms of approach motivation, differentially influenced whether information was processed in a more top-down (global) or more bottom-up (local) way. Two-hundred twenty five undergraduates completed a computerized global-local categorization task that measured participants reaction times when forced to process images in a globally (top-down) or local (bottom-up) manner. This task was completed before and after watching a sad or anger-evoking clip. After the clip, they self-reported emotional intensity. Self-reported sadness after the film related to increases in global reaction times from before to after the film, $r = .218$, $p = .087$. Greater sadness was also related to greater global reaction times compared to local reaction times after the sad film, $r = .247$, $p = .051$. Greater self-reported anger after the film related to increases in local reaction times from before to after the film, $r = .341$, $p = .011$ and greater local reaction times compared to global reaction times after the angry film, $r = -.250$, $p = .066$. Results illustrate differences in how sadness and anger influence information processing, expanding our understanding of how motivational intensity relates to cognitive processing across distinct emotions of the same valence.

Medicocriminal Entomology is a lesser-known application of Forensic Science involving the utilization of saprophagous and/or carnivorous arthropods as evidence to be used in solving crimes. Medicocriminal Entomology, more widely referred to as Forensic Entomology, unites aspects of human decomposition and the adversarial justice system (Byrd and Castner 2009). The data collected by Forensic Entomologists can be used to attain the time of insect colonization, the period of insect activity, and subsequently, the estimation of the post mortem interval. On decaying organic matter, insect presence is experienced in successional waves that correspond to different stages in the decay process (Byrd and Castner 2009). However, various intrinsic and extrinsic factors can greatly challenge the ability to obtain consistent insect successional data. Therefore, to begin to understand Southern California’s insect succession during winter months, and to demonstrate to the general public the duties of a Forensic Entomologist, we exposed a swine corpse to natural environmental conditions for a two and a half month period. The corpse was photographed and surveyed once a day, for four weeks total. Surveys included insect sampling and later identification and preservation in lab. The surveys concluded that the primary colonizers of the pig corpse consisted mostly of insect species that were noted as abundantly present during the beginning week of the study. Samples reared in lab also supported this finding.
Keith Frogue, Chemical Engineering; Cory Schwartz  
Faculty Mentor: Dr. Ian Wheeldon, Chemical Engineering  
*Developing Standardized Genome Editing Tools for Pathway Engineering in Yarrowia Lipolytica*

The yeast Yarrowia lipolytica has the potential to be a valuable host for lipid-based biochemical processes. Exploring this potential requires the development of synthetic biology tools that can facilitate rapid strain development of this oleaginous yeast. A CRISPR-Cas9 based tool was developed by the Wheeldon Lab for markerless gene integration into the *Y. lipolytica* genome. With this tool, seventeen genetic loci were investigated for increased homologous recombination (HR). Five sites were shown to have increased heterologous gene integration: MFE1, AXP, A08, D17, and XPR2. To show the utility of this markerless integration tool, the non-native lycopene biosynthesis pathway was integrated into *Y. lipolytica*’s genome. Lycopene production was achieved with a yield of 3.38 mg lycopene/ g DCW. With this standardized system for integrating heterologous genes in *Y. lipolytica* the lycopene biosynthesis pathway was introduced and enhanced, demonstrating the utility of this tool for pathway engineering.

Evelyn Gámez, Spanish and Linguistics  
Faculty Mentor: Dr. Covadonga Lamar Prieto, Hispanic Studies  
*Locating the Presence of Code-Switching in Nineteenth Century Californio Spanish Dialect*

I have collaborated on the transcription of a XIX century text *Recuerdo históricos y personales tocantes a la Alta California* written by Mariano Guadalupe Vallejo, within the Spanish of California Lab (SoCaLab) at UCR. The previously unpublished text, with approximately 2,000 words recounts the history of Hispanic California before the Annexation to the U.S. In the text appears some of the first documented occurrences of the mixing of codes between Spanish and English languages in the territory. I have located and examined these cases, and I will be presenting them as proof that such instances can be dated back to XIX, disregarding the idea of code-switching being a new phenomenon. California’s history can be told through three different perspectives: Spanish, Mexican and American. Across what appears to be crucial periods for the history of California, it is of important to note that this linguistic phenomenon happened in a very short time-span. This allows us to see the influences that a language and a culture have on one another, and sort of as a consequence, the effect that dialects have on each other. Also, contrary to popular belief, it aims to credit a very politically established used of Mexican Spanish in California during these three crucial periods mentioned before. This case study aspires to promote California historical sociolinguistics, which will help better understand code-switching and prove a history for contemporary Spanish in California.
Fraxinellone is a natural product in the limonoid family, derived from a root bark (*Dictamnus dasycarpos*) used in traditional Chinese medicine to treat inflammation and jaundice. Neurodegenerative diseases such as Alzheimer’s, Parkinson’s, and epilepsy are correlated with an excess of glutamate, an excitatory neurotransmitter where in surplus amounts can cause an over-excitation of neurons, leading to cell damage and death. In experiments, fraxinellone has shown to display neuroprotective properties against excitotoxins such as glutamate; however, the exact mechanism behind the neuroprotection is still unknown and is our goal of research. Fraxinellone’s structure shares a furan ring and a lactone ring with others in the limonoid family (obacunone and limonin) that have also displayed neuroprotective effects, leading to the hypothesis that the properties must stem from these structures. Our objective is to attach a fluorescent molecule to the portion of fraxinellone that does not share structural similarities with the other neuroprotective molecules when fraxinellone is introduced to neurons, the portion of the cell affected would fluoresce without compromising the desired properties. We have so far successfully extracted pure fraxinellone from the root bark through sonication, column chromatography, recrystallization and confirmed the structure by $^1$H NMR. We are in the process of synthesizing an alcohol derivative of fraxinellone by reacting with selenium dioxide, which will add the hydroxyl group onto the achiral methyl. Then we will attach the fluorescent tag onto the oxygen of the alcohol away from the structures responsible for neuroprotective properties. Then send off our fraxinellone derivative to conduct experiments on neurons.

Stephany Garcia, Psychology; Vanessa Zavala, Psychology; Tiffany Reynolds, Psychology Law and Society; Christine Lam, Psychology
Faculty Mentor: Dr. Rebekah Richert; Psychology
*Preschoolers Use Others’ Effort as a Cue to Attention and Learning*

Even young children demonstrate selective trust abilities in learning information from others (Harris & Koenig, 2006). However, it remains unclear if selective trust affects children’s online processing of content and their learning of content. In this study, we examined whether a child preferred to learn how to solve a problem from an informant who tried hard (high effort) or an informant who could easily solve the problem (low effort). Of particular interest was whether children’s selective trust was reflected in their eye movements. If children selectively prefer someone who is working hard, we expected that children would gaze longer at the high effort informants and be more likely to choose the high effort informant’s solution to the task. Children (3-6 years; $N = 69$) were presented with four videos of two informants solving problems, during which their eye movements were being recorded. One informant demonstrated high effort after saying “I’m going to try hard” whereas the other demonstrated low effort after saying “I don’t need to try hard.” The two informants then simultaneously solved a new problem that involved moving marbles. After watching the video, children were asked to solve the marble problem by themselves. We coded children’s solution choice and proportion of looking to high and low informant. The results of a repeated-measure ANOVA showed that children paid higher attention to high effort informant than low effort informant, $F(1, 54) = 2.91, p < .001$. Further analyses will examine how children’s attention relates to their solution choice.
Entomopathogenic nematodes, or EPNs, are insect-parasitic nematodes that are used in biological pest control due to their ability to quickly kill their insect hosts. The free-living (outside of the host) stage of the nematodes, known as infective juveniles (IJ’s), are developmentally arrested until they infect a host and undergo the process of activation. Activation initiates the parasitic lifestyle, which involves morphological changes such as cuticle exsheathment, opening of the mouth/esophagus, and expansion of the pharyngeal bulb. These morphological features are easily discernable and allow for the quantification of parasitic activation rates. Among the EPNs, Steinernema carpocapsae is a generalist parasite, capable of infecting many different insect species. Whereas, Steinernema scapterisci has a narrow host range and is considered a cricket specialist. The contrasting host ranges of S. scapterisci and S. carpocapsae allows them to serve as powerful comparative models to study parasite specialization. For a better understanding of parasite specialization, we utilized an in vitro model of insect infection and compared the activation rates of S. scapterisci to S. carpocapsae when exposed to an assortment of different insect hosts.

Investigation of Potential Suppressors of stn1-281t in Saccharomyces Cerevisiae

The model organism Saccharomyces cerevisiae can be used to examine phylogenetically conserved cellular mechanisms maintaining genome integrity. STN1 is a member of the three protein CST complex and associates with the ends of linear chromosomes, referred to as telomeres. CST has been suggested to form a cap at telomeres that helps protect them from degradation. Interestingly, data from our lab and other labs working on vertebrate systems shows that STN1 is playing an additional role in DNA replication. Our ongoing work supports STN1 interacting with the DDK kinase, a protein dimer responsible for phosphorylating the MCM helicase to initiate replication throughout the genome. Our lab has constructed a yeast strain that expresses a truncated version of the STN1 gene known as stn1-281t. This truncation confers very weak growth, temperature sensitivity, and abnormal telomeres that is more severe than other stn1 truncations. For this study, we have introduced mutations that bypass the need for DDK activity, mcm4Δ74-174 and mcm5-bob1, separately into the stn1-281t background. Importantly, preliminary work indicates these so-called bypasses improve growth of stn1 strains, suggesting that poor growth is connected to reduced DDK activity towards MCMs. These MCM mutations will be investigated through various means to determine if they suppress the phenotype from stn1-281t. The goal of these experiments is to elucidate if, like stn1-186t, various aspects of the stn1-281t phenotype can be suppressed by MCM bypasses. If they cannot, it suggests that regions between residue 186 and 281 in Stn1 prevent the MCM alleles from bypassing the truncation.
Jessica Gonzalez-Lopez, Psychology
Faculty Mentor: Dr. Elizabeth L. Davis, Psychology

How Do Individual and Dyadic Parent-Child Emotion Regulation Processes Relate to Conflict During a Frustrating Task?

Research shows that children develop their emotions, social skills, and their ability to communicate with others through observing those around them. Parents teach their children social skills by modeling emotion regulation strategies, reacting and expressing different emotions, and discussing emotions with their child (Southam-Gerow and Kendall, 2012). Specifically, this study aimed to investigate how parents and children’s emotion regulation processes related to their interpersonal interaction during an emotionally challenging episode. One-hundred eighty four children (93 girls) between the ages of 3 and 11 years of age, and one of their parents participated in the study. The participants came into the lab one time accompanied by a parent and engaged in a frustrating task. Parents were asked to fill out a questionnaire packet that measured their child’s emotion regulation, their own emotion regulation, and their typical reactions to their children’s displayed negative emotions. In the frustrating task, children were promised a special prize if they could assemble a Lego model of Big Ben in five minutes without any physical help from their parent. In the first phase, parents were instructed not to help. In a second phase of the task, parents were instructed to help in any way they liked. This frustrating task was coded with a scale developed for this study that measured conflict behavior during the parent-child Lego building interaction. Preliminary results highlighted a lack of zero-order associations between parent-child emotion regulation processes, parent’s reactions to child’s negative emotions, and dyadic conflict. Planned analyses will examine the interplay of parental, child, and dyadic processes.

Samantha Granado, Neuroscience; Trina Mansour, Matt Gomez
Faculty Mentor: Dr. Emma Simmons, School of Medicine

Provider and Patient Satisfaction within Student Run San Bernardino Free Clinic

The purpose of this research project is to study satisfaction among both patients and health care providers to improve clinic flow, practices, and interactions at the Student Run San Bernardino Free Clinic. Patient satisfaction relies on many factors, such as wait time, friendliness and communication of medical staff, hours of operation, and services that the clinic provides. For health care providers, satisfaction is dependent on the interaction between colleagues and with patients, hours they work, time spent with patients, and familiarity with their patients. Physician and patient satisfaction strongly interact, but it is the patient’s satisfaction with care that determines whether they will return. By increasing patient satisfaction, they are more likely to return to the clinic, become proactive in their health maintenance, and ultimately improve their health and wellbeing. This is especially important considering that San Bernardino County has among the worst health outcomes in California. Participant-specific surveys were implemented within the clinic, including patients, preceptors (Resident and Attending Physicians), medical students, patient advocates, and other health care providers dealing with health education. Participants rated multiple areas of the clinic and provided their own additional feedback, which was relayed to the health care providers within the clinic. Once areas for improvement were identified, changes were implemented within the clinic to see if scores on the next survey would increase.
The Effect of Experimentally Manipulating Nap Frequency on Nighttime Sleep Quality: An Actigraphy Study

Whether and how daytime sleep impacts nighttime sleep is unclear. Here, we examined the causal relationship between napping and nighttime sleep quality using a napping intervention. Thirty-eight healthy adults recorded daily sleep diaries and wore an actigraph for five weeks. The first week (baseline), participants reported if they napped each day, and were categorized as either habitual nappers (HN) or non-nappers (NN). Following baseline, all participants were randomly assigned to one of two conditions: Nap Practice (instructed to nap at least three times/week) or Restriction (instructed to not nap at all). Actigraphy data estimated nighttime sleep variables (bedtime, wake time, and total sleep time) for ~36 individual nights/subject. Compared to NN, HN went to bed later at night and had less total nighttime sleep during the baseline week. However, there was no difference in HN nighttime sleep on nights following a nap versus nights with no nap. During the intervention, HN+Restriction showed no differences in nighttime sleep compared to HN+Practice, and neither condition differed from baseline. NN+Restriction also did not differ from baseline, but the NN+Practice showed an overall decrease in total sleep time. In summary, this study found differences in the impact of daytime naps on nighttime sleep in habitual and non-habitual nappers. Experimentally manipulating nap habits did not change HN nighttime sleep characteristics. However, for NNs, the nap intervention decreased nighttime sleep duration. These data suggest that nap habits may arise from differences in homeostatic and/or circadian regulation of sleep.

Decision-Making in Action: Examining Effects of Pre-Crastination and End-State Comfort

In this study, we will explore the extent to which people front-load physical demands in action planning. We will evaluate the relative contribution of two front-loading tendencies that have been found in this domain. One is precrastination, the tendency to complete sub-goals as soon as possible, even at the expense of additional physical effort. The other is end-state comfort, the tendency to grasp objects in awkward ways to promote comfortable final positions. No previous study has examined the combined contributions of these two tendencies. Subjects will be asked to pick up a bucket on a left or right stool, each 8 or 12 feet away from a start point. Then carry the chosen bucket to a left or right bowl where the mouth is only slightly wider than the base of the bucket. The bowl will be on a stool or on the ground. If precrastination trumps end-state comforts, subjects should choose the bucket that is closest even if that bucket must be set on the lower bowl. However, if end-state comfort trumps precrastination, subjects should do the opposite. The results will help constrain a theory of action planning in which some constraints are assumed more important than others plan.
Wenyi Gu, Psychology; Rachel Shia, Alex Leung  
Faculty Mentor: Dr. Thomas Sy, Psychology  
The Effect of Dyads’ Conceptions of Followers on Job Satisfaction Through Leader-Follower Relationships  

Previous research has identified job satisfaction as one of the key components for employee commitment and organizational success (e.g., Vandenberg & Lance, 1992). In the current study, we examined how dyadic implicit followership theories (DIFTs) (conceptions of followers) may influence dyad’s overall job satisfaction. Specifically, we investigated the relationships between DIFTs, leader-member exchange (LMX), and job satisfaction in 198 dyads. Results showed positive DIFTs are positively related to job satisfaction, while negative DIFTs are negatively related to job satisfaction. In addition, positive DIFTs are positively related to LMX, while negative DIFTs are negatively related to LMX. Our study demonstrated that the associations between DIFTs and job satisfaction are partially mediated by LMX. Implications for employee commitment and organizational success were discussed and future directions were provided.

Karan Gupta, Mechanical Engineering  
Faculty Mentor: Dr. Sundararajan Venkatadriagaram, Mechanical Engineering  
Developing a Physical and Data-Driven Model for a 3-phase Induction Motor for Condition Monitoring and Fault Diagnosis of Static and Dynamic Air-Gap Eccentricities  

Three-phase induction motors are used in a variety of applications such as power plants, manufacturing and transportation making the study of their failure of great importance. To develop a reliable condition monitoring system to diagnose faults in motors, it is vital to model all potential failures and validate these models with experimental simulations of the failures. One of the key failures in an induction motor is an air gap eccentricity. A model was created for a healthy motor from electric machine theory and literature, and the appropriate parameters were adapted to simulate mathematically the effects of 15%, 30%, 45% and 60% eccentricities. Since the theoretical outputs were known for each of those conditions, experiments were designed to verify them. To do this, the stator and rotor axes were shifted in 1hp and 2hp motors using sleeve inserts for the bearings. Data obtained from attached three-axis accelerometers is then processed using the Fast-Fourier transform (FFT), the Discrete Wavelet transform (DWT), and the Hilbert-Huang transform (HHT), in order to identify trends in how the key signatures for each eccentricity level change. Two motor sizes were used to see how much scaling the model affects the trends found. The key signatures obtained will be compared to those found in literature to ensure reliability in our experimental setup. After concrete trends are found and confirmed, we will use machine learning to see if the level of eccentricity can found given a data signal for a machine with unknown eccentricity level.
Danielle Hamilton, Biochemistry; Xin Li, Biochemistry  
**Faculty Mentor:** Dr. Ming Lee Tang, Chemistry  
*Splitting Photons: Singlet Fission in a Hybrid System*

The silicon solar cells on the market today fall short of absorbing all of the energy available in sunlight. In order to improve the efficiency of these photovoltaic (PV) cells, we have developed a system that is capable of capturing and utilizing more of the energy stored in sunlight. Currently, some of this energy is lost as heat due to silicon's small bandgap. Our system -- which is composed of an organic chromophore, diphenylhexatriene (DPH), and an inorganic nanocrystal (NC), lead sulfide (PbS) -- is capable of performing singlet fission (SF). SF is a spin-allowed process in which a high-energy singlet is converted into two, lower-energy triplets. The goal is to couple the production of these triplets with triplet energy transfer (TET) to improve the overall photoconversion efficiency in solar devices used today. In this experiment, we have demonstrated that DPH undergoes singlet fission when excited with UV light and subsequently passes on the generated triplets to the NC via TET.

Yasmien Hanania, Neuroscience; Kasim Pendi, Neuroscience; Sonia Afroz, Sarah Reinhard  
**Faculty Mentor:** Dr. Iryna Ethell, Biomedical Sciences; Dr. Khaleel Razak, Psychology  
*Impaired PV and PNN Expression in CA1 Hippocampus May Underlie Contextual Recall Deficits after Auditory Fear Conditioning In FMR1 Knockout Mice*

Fragile X Syndrome (FXS) is a genetic condition known to cause intellectual disabilities and autistic behaviors. FXS originates from reduced FMR protein (FMRP) expression caused by the expansion and increased methylation of trinucleotide repeats (CGG) in the un-translated 5' region of Fragile X Mental Retardation 1 (*FMR1*) gene. In this study, we used a mouse model of FXS to study the cellular mechanisms underlying impaired learning following auditory fear conditioning and extinction in *Fmr1* KO mice. The fear conditioning protocol included habituation, training, and extinction in conditioned and alternate contexts. Contextual learning was assessed in WT and *Fmr1* KO mice by measuring freezing behaviors using Freezeframe and TopScan Lite software. While no differences in freezing were detected between groups during tone recall, contextual recall was significantly impaired in *Fmr1* KO mice. As changes in the expression of paravabumin (PV) in inhibitory interneurons and the organization of perineuronal nets (PNN) were previously observed in CA2 and CA1 hippocampus during fear conditioning learning and recall, we investigated the effects in *Fmr1* KO mice. *Fmr1* KO mice showed a post-conditioning decrease in PNN CA1 hippocampal pyramidal neurons similar to WT mice. However, *Fmr1* KO showed a pre-conditioning reduction in PV expression that was also observed following training. These findings suggest that the reduced density of PV-expressing inhibitory interneurons in the CA1 hippocampus may underlie the contextual memory deficits in *Fmr1* KO mice.
Sandy Hanna, Neuroscience; Amanda Nguyen, Jordan Koeppen, Simone Woodruff, Arnold Palacios
Faculty Mentor: Dr. Iryna Ethell, Biomedical Science

Role of Astrocytic ephrin-B1 in Synaptogenesis in the Developing Hippocampus

Ephrin-B1 is known to be expressed by neurons and influence cell adhesion and development of circuits in the nervous system through its interactions with neuronal EphB receptors. Recent studies in our lab suggest that ephrin-B1 in astrocytes is involved in regulating synaptic responses in the adult mouse hippocampus through glial-neuronal interactions. Astrocyte-specific deletion of ephrin-B1 resulted in an increase in the number of silent synapses. Dendrites in the CA1 hippocampus of ephrin-B1 knockout mice also showed abundance of immature dendritic spines, sites of the silent synapses. The study indicates that astrocytic ephrin-B1 is involved in pruning of the silent synapses to maintain mature and functional synaptic network in the adult hippocampus. In this study, we assessed the effects of knocking out ephrin-B1 in developing hippocampal astrocytes at postnatal days (P)14. Astrocytic ephrin-B1 deletion is achieved by crossing homozygous floxed ephrin-B1 female mice with Cre-GFAP-ERT2 male mice, followed by tamoxifen injection to induce ablation of astrocytic ephrin-B1 at P14. Synapses and dendritic spines are analyzed in the striatum radiatum layer of the CA1 hippocampus brain sections obtained at P28. We predict that astrocytic ephrin-B1 is also involved in the synapse removal during development and ephrin-B1 deletion from astrocytes will result in excessive formation of spines and synapses in the developing hippocampus. In contrast to the effects of ephrin-B1 deletion in the adult hippocampus, we expect an increase in synaptic responses and mature spines in the developing hippocampus during the process of active formation of new synaptic connections.

Roxana Haro, Biology; Eleinis Ávila-Lovera, Mark de Guzman, Luis Torres
Faculty Mentor: Dr. Louis Santiago, Botany and Plant Sciences

Leaf Carbon Isotopic Composition and Drought Survival Traits in a Chaparral – Desert Transitional Ecosystem of Southern California

Over the past years, California has faced one of the worst droughts in history. This stress reduces plant photosynthesis, transpiration, and survival rates. For this reason, it is important to study how California plants can survive in low water conditions. It is known that plants with higher water-use efficiency (WUE) are better adapted to survive in drought conditions and that high WUE is related to high leaf carbon isotopic composition ($\delta^{13}C$). What is not well known is how $\delta^{13}C$ is influenced by, or can influence other drought survival traits. To study the relationship between $\delta^{13}C$ and drought survival traits, we measured $\delta^{13}C$, leaf phenology, presence or absence of photosynthetic stems, stomatal conductance ($g_s$), leaf hydraulic conductance ($K_{leaf}$), cuticular conductance ($g_{min}$), turgor loss point (TLP), and specific leaf area (SLA) of 20 species in a Chaparral – desert transitional ecosystem near Morongo Valley, California. From these traits, only leaf phenology, presence or absence of green stem, $g_{min}$, and TLP showed a significant correlation with $\delta^{13}C$. The results indicate that plants with evergreen phenology and plants without green stems both have a high $\delta^{13}C$. Also, low $g_{min}$ and TLP were associated with high $\delta^{13}C$, therefore high WUE. These results showed that WUE estimated by $\delta^{13}C$ is a valuable trait to understand plant responses to drought. By understanding which traits plants in drought-prone ecosystems use in their response to drought, we will be able to better predict the mortality rate of other plants in the ecosystem.
Amy Heisinger, Psychology
Faculty Mentor: Dr. Thomas Sy, Psychology
*Positive Emotionality Mediates the Relationship Between Self-Perceptions of Leadership and Leader Effectiveness/Job Satisfaction*

The purpose of this paper is to analyze the relationship between Self-Perceptions of Leadership (how one views him or herself as a leader), Leader Effectiveness (how one views their leader), Job Satisfaction and PANAS Positive (measure of positive emotions). Our analyses show that there is a strong correlation between individuals’ trait positive emotionality (measured using PANAS) and their perceptions of themselves as a leader, meaning that those who view themselves as a leader also tend to rate themselves as experiencing more positive emotions in general. Self-Perceptions of Leadership correlate with individuals’ ratings of Leader Effectiveness and Job Satisfaction. Our research shows that, in both cases, this relationship is mediated by individuals’ positive emotionality. It appears that positive emotionality plays a pivotal role in the relationship between a person’s perceptions of him/herself as a leader, how s/he perceives his/her own leader, and how satisfied s/he is with their job. We argue that this is because individuals who tend to have higher levels of positive emotions, in general, also tend to be more confident and are more well-liked by their peers. These individuals may then be more likely to view themselves as leader material and to have a higher regard for their jobs and for their own leader. In conclusion, we suggest that positive emotions mediate the relationships between individuals’ views of themselves as leaders, how they view their own leader, and how they rate their job satisfaction.

Kyle Hill, Biology; Kevin Rodriguez, Alex Plong
Faculty Mentor: Dr. Venu Gonehal, Botany and Plant Sciences
*Determining the Role of WUSCHEL Interacting Cofactors in Stem Cell Homeostasis*

WUSCHEL (WUS), a homeodomain transcription factor, is critical for *CLAVATA3 (CLV3)* expression and stem cell homeostasis. To identify coregulators of WUS, our laboratory screened a library of Shoot Apical Meristem (SAM) expressed genes in a Yeast Two Hybrid (Y2H) assay. One such WUS interacting cofactor also showed a compromised SAM when a loss of function mutation was introduced. Our microarray map places the expression of this cofactor in the peripheral zone, flanking the WUS and CLV3 expression domains. We are constructing a translational reporter fusion driven by the native promoter to determine the location of the cofactor protein in relation to the WUS protein. To test the interaction *in planta* we are using Bimolecular Fluorescence Complementation (BiFC) with WUS and the cofactor, and to understand the function of heterodimerization, we are mapping the domains of interaction using a Y2H system with several different WUS protein fragments. Interaction domains on the WUS protein, found in the fragments of the Y2H, can be mutated or deleted to give some clue to the function of the interaction in its native environment. This domain data can be applied to analyze the effects of loss of heterodimerization, and taken with the localization data we can begin to determine the role of the cofactor in WUS function, CLV3 expression, and stem cell homeostasis.
Trina Ho, Biology  
Faculty Mentor: Dr. David Volz, Environmental Sciences  
Acute Toxicity Screening of the LOPAC$^{1280}$ Library in Zebrafish Embryos

There are thousands of compounds in commerce with limited toxicity data available. The use of zebrafish embryos as an alternative non-mammalian model organism allows for relatively inexpensive and efficient screening of a wide variety of compounds, while providing a complex physiological context with the potential for different organ systems to interact. Using a high-content assay to screen the LOPAC$^{1280}$ library (a well-defined library of 1,280 pharmacologically active compounds), approximately 4% of the library was identified as acutely toxic, resulting in <85% survival in zebrafish embryos. The focus of our study was to find potential predictors of acute toxicity by exploring relationships between zebrafish embryo survival at 24 hours post-fertilization and the physicochemical properties of each acutely toxic compound, including drug class, molecular weight, and partition coefficient (LogP). Our results suggest that there is no association between embryo survival and these physicochemical properties, likely due to the variable nature of the zebrafish embryo, assay setup, and non-biological issues, such as the makeup of the LOPAC$^{1280}$ library.

Jay P. Hotrum, Political Science  
Faculty Mentors: Dr. Richard Cardullo, Biology; Dr. Ajay Verghese, Political Science  
Drug Abuse and Politics. What Happens When Rational Actors Become Addicted to Mind Altering Drugs?

Political scientists study state-sponsored conflicts through models pertaining to the how and why aspects of war, while historians are the true record keepers of wars past. Books are written about strategies that often take positions where certain hasty decisions tilt battles to one side or the other, which may have caused the course of history to change the record entirely. However, what if the factors being studied in conflicts were twisted in such a way that even historians may have been misled as to the actual conditions that were attributed to cause and effect? In my presentation, I will investigate drug use as a weapon of war by state actors, as well as the armies they command. My research has examined drug abuse on such a broad scale that the actual drugs may have not only fueled parts of the conflict, but at some points may even be linked to possible causation in some of the most brutal human rights abuses on record. In my presentation, I will briefly discuss new evidence released by the U.S. Nazi War Crimes Disclosure Act and concentrate specifically on methamphetamine abuse during World War II, the over 6 million people killed during The Holocaust, and drug abuse by Adolf Hitler and his Third Reich.

In effect, I will outline an argument that this single drug is mankind’s biggest threat, and that somehow history has either minimized or completely erased these facts whenever mentioned as irrelevant, where in fact it may well be the most relevant event in modern times.
Kymberly Howo, Biology  
Faculty Mentor: Dr. Kurt E. Anderson, Biology  
Assessing the Morphological Effects of Aquatic Acidification on Model Organism Daphnia Magna

Anthropogenic-driven climate change and understanding its effects on habitats/ecosystems and organisms is one of, if not the most, pressing issue facing the scientific community today. As the globe warms and atmospheric CO2 levels increase, a corresponding change is concurrent in aquatic environments in the form of acidification, or a lowering of pH. This change has catastrophic ramifications for organisms that rely on stable and constant acidity, such as shell building animals (Mollusks like clams, snails, mussels, etc.) as well as chitinous animals like lobsters, crabs and shrimp. The exterior body covering of crustaceans (or carapace) is composed of chitin, a biological material that contains calcium as a significant component. While significant work has been done with Mollusks revealing the negative correlation between acidification and productivity, the body of knowledge concerning Crustaceans is not fully understood or explored. I propose to study the effects of increasing acidification on the crustacean laboratory organism Daphnia magna, as a model for assessing the response of crustaceans to acidity. I anticipate a measurable deleterious effect of increasingly low pH on the productivity of the Daphnia. As Daphnia comprise a significant role in the zooplankton assemblage, and as a model Cladoceran, they are useful in gaining insight into the role lowering pH has on the general productivity of chitinous aquatic organisms, and especially in the morphological deformation seen in other Crustaceans.

Gregory B. Hutchins, Political Science  
Faculty Mentor: Dr. Ronald O. Loveridge, Political Science  
Insolvency to Sustainability: An In-Depth Look at Bankruptcy Recovery for California Cities

Since the economic downturn in 2008, there have been city governments across the United States that have gone through bankruptcy. In California, four cities have filed for Bankruptcy. Vallejo and Stockton have completed the process, San Bernardino is still in the process, and the fourth city did not complete the process of bankruptcy. Cities are the center economic development and largely determine one’s quality of life. Cities provide many key services, including police, fire, parks and recreation, land-use planning, public works, and libraries. This project focused on two cities in California, analyzing their various paths to recovery. An in-depth analysis was done on Stockton and Vallejo, tracing their path of bankruptcy from causes to actions that place them on recovery. Following the analysis, this project helped create a set of recommended “Best Practices” to help California cities recover from bankruptcy. This project attempts to illustrate implementation plans for the “Best Practices” to be implemented into the city of San Bernardino or other cities in California.
Raymond Iu, Bioengineering; Hayden Karich, Mechanical Engineering  
**Faculty Mentor:** Dr. William Grover, Bioengineering; Dr. Doug Hill, Bioengineering  
*Industry-Level Quality Control in a University Research Lab*

Translating academic research to industry-ready products is notoriously difficult. In this project, I sought to make academic research more industry-ready by implementing industry-standard quality control in an academic research lab. The research at the focus of this project was an electronically controlled valve that is part of the “MEC system,” a library of building blocks that can be used to create custom research instruments. In its initial form, the valve was a solenoid connected to a spring that operated the valve through a magnetic field. It had a 95% working rate at its peak efficiency. With each MEC-based instrument commonly having many valves, a 5% failure rate is far too high. To improve this situation, I focused on “smart” component development. I applied quality assurance principles and smart component designs to create the second generation of MEC valves. These new valves have 3D-printed casings with interior wiring composed of shape memory actuator wire (“muscle wire”), crimp beads, a “horse bit” structure, and 24-gauge wire. The valve is normally held closed with a compressed spring, but opens when the muscle wire receives electrical current. I also created spreadsheets to track activation time, decompression time, and other pieces of data in relation to muscle wire length. A fully automated testing device is being created to streamline this data collection. A programmed microcontroller will test three connected valves’ efficiency, durability, and current output. Ultimately, I demonstrated that it is possible to improve the efficiency of a valve to industry-level standards in a university research lab by maintaining proper quality assurance standards.

Sonia Josemoan, Biochemistry; Parisa Parsafar, Psychology  
**Faculty Mentor:** Dr. Elizabeth L. Davis, Psychology  
*The Effect of Mindfulness Meditation on Positive Emotional Intensity after Experiencing Negative Emotion*

Mindfulness Meditation (MM) is associated with higher levels of emotional awareness and positive affect, decreased levels of negative affect, and an overall greater life satisfaction. Recent work suggests that the experience of negative emotions can have powerful benefits. We examined 1) how the experience of negative emotion might influence the intensity of subsequent positive emotion and 2) whether MM influences these associations. 225 undergraduates were randomly assigned to listen to either a 25-minute MM condition or a comparison condition (CC) after which they were shown a three-minute negative emotion film (sad or angry). They then self-reported the intensity of their negative emotion. Approximately 40 minutes later, they reported the intensity of joy after watching an amusing film. For participants in the mindfulness condition, greater intensity of negative emotion after the sad or anger evoking film clip was associated with greater intensity of joy after watching the amusing film (sad film $r = .360$, $p = .034$, anger film, $r = .324$, $p = .044$). For participants in the comparison condition, the intensity of their negative emotion after the sad or anger evoking film clip was not related to the intensity of joy reported after seeing the amusing film (sad film $r = .287$, $p = .10$; anger film $r = .281$, $p = .113$). The intensity of negative emotion is related to the intensity of a subsequent positive emotional experience for participants who received MM training. MM might influence emotional awareness and cognitive processes that allow individuals to savor positive emotional experiences after experiencing a negative one.
Hayden Karich, Mechanical Engineering  
**Faculty Mentor:** Dr. William Grover, Bioengineering; Dr. Douglas Hill, Bioengineering

**Laboratory Material Transport Project for the Technology Evolution Components Center**

The main problems faced by the world today are challenging to solve in part because they are interdisciplinary. In our research, we are working to improve this situation by developing an interdisciplinary component set that can address real-world problems such as climate change, hunger, and early disease detection. Using these components, researchers can build instruments quickly and inexpensively. The Lab mission statement is centered on preparing engineering students to address these real world problems in a professional engineering environment. The Laboratory Material Transport project serves to achieve these goals. The Laboratory Material Transport project comprises a fixed, sealed tube that uses air pressure and vacuum to transport a cylindrical “shuttle” to various points along the tube. Vacuum and air pressure are exchanged throughout the system using a muscle wire-operated valve. Components, like the muscle wire valve, are continually designed and evolved for the system construction. These new components are added to our general “toolset” to be repurposed for other projects. Through the “toolset,” we will have generated an extensive library of inexpensive parts for future problem solving. The Laboratory Material Transport project can also be used to automate future experiments in the lab. Finally, the Laboratory Material Transport project also serves as a method of engineering instruction. The student working on this project gains a great deal of experience with mechatronics, design, and problem solving. Students working on these sorts of hands-on projects walk away better prepared to attack real problems in the engineering world.

Mahera Khan, Sociology; Laura Quinones-Camacho, Psychology  
**Faculty Mentor:** Dr. Elizabeth Davis, Psychology

**Effects of Parental Emotional Regulation and Warmth on Children’s Emotion Regulation**

Parents’ emotion regulation ability has been linked to children’s emotion regulation ability (Morelen, Shaffer, & Suveg, 2014), as has parents’ reassurance and ease (e.g., warmth) during difficult situations (Mathis, 2012). The goal of this project was to explore how parental emotion dysregulation and warmth jointly related to children’s emotion regulation. One hundred eight-four (184) children (3-11 years; M = 7.67; SD = 2.30; 49.2% girls) and their parents participated. Parents reported on their emotion dysregulation and children’s emotion regulation. Parents and children worked on a difficult Lego puzzle together. Parental warmth during the task was globally coded, with higher scores indicating greater warmth (physical affection and encouragement). Regression examined whether parental emotion dysregulation, parental warmth, age, and sex were associated with children’s emotion regulation. Parental emotion dysregulation (\(b = -.007, t = -3.810, p < .001\)) and warmth (\(b = .046, t = 1.9248, p = .056\)) were associated with children’s emotion regulation in the expected directions. These effects were qualified by a significant 3-way interaction of parental emotion dysregulation, warmth, and children’s age, \(b = -.002, t = -2.991, p = .003\). Greater parental emotion dysregulation was associated with poorer emotion regulation for all children, except older children with less warm parents. Our results suggest that as children develop greater autonomy in their emotion regulation, having warm and encouraging parents might be particularly important, rather than simply having well-regulated parents.
Grace Khanlian, Political Science  
Faculty Mentor: Dr. Jennifer Merolla, Political Science  
*Good News or Bad News: Analyzing News on Social Media Platforms*

Social media has become a key component of news sharing in the recent decade due to the widespread communication readily available in a matter of seconds. To some, social media platforms such as Twitter, Facebook, and Instagram are the sole source of their news. However, sometimes news on social media is presented in an extremely positive or an extremely negative way. Several studies have been done on determining whether news television channels depict news in a negative or positive light. However, not many studies exist on determining what news stories end up on social media. My research is a three-month study, where I will analyze daily trending topics on social media platforms and categorize them as “positive”, “negative”, or “neutral.” Tone, topic, and subject will be collected and analyzed. For example, news stories that depict new technologies and new alliances are going to be rated positive. Stories that explain fashion or celebrity topics are depicted as neutral. Negative news includes protests or signs of conflict.

Ivy Kim, Political Science & International Affairs  
Faculty Mentor: Dr. Marissa Brookes, Political Science  
*Transnational Labor Alliances (TLAs) Database Project: Coding Successes and Failures*

When transnational corporations (TNCs) violate the rights of workers, labor campaigns can form at the national level. However, when employers still refuse to negotiate or comply with labor rights, workers may seek assistance from unions or other organized groups of workers at the international level. Transnational labor activists then put pressure on employers, which sometimes results in the successful protection of workers’ rights. The Transnational Labor Alliances (TLA) Database Project collects information on labor campaigns actively supported by unions or workers in multiple countries. In addition to serving as an archive of key documents relating to these campaigns, the database also features detailed timelines documenting each transnational labor campaign with outcomes coded as full success (SS), partial success (PS), partial failure (PF), full failure (FF), or ongoing (O). A success can be defined as “at least one partner in the labor alliance obtaining either material benefits or strategic gains without suffering losses significant enough to outweigh those gains” (Brookes 2013, 194). Each timeline is designed to include specific strategies or actions that workers use not only on the national scale but also, especially, on the international scale. Our data include sources, timelines, and interviews transcribed verbatim. This database can ultimately be used to help determine what causes a campaign to succeed or fail.
Kassandra Kin, Cell, Molecular, and Developmental Biology; Tiffany Baiocchi  
Faculty Mentor: Dr. Adler Dillman, Parasitology  
*Prenol and Its Effect on Entomopathogenic Nematodes as a Dispersal Cue*

Entomopathogenic nematodes (EPNs) are insect-killing parasites that are used in the agricultural industry as biological-control agents against insect pests. EPN infective juveniles (IJs) –are the free-living stage that infect insect hosts in order to complete their life cycle. IJs use chemosensory cues for many reasons including dispersal from the old host, location of new hosts and avoidance of already-infected hosts. My work aims to evaluate prenol – an odorant associated with late-stage infected hosts- as a cue that may trigger dispersal behavior. Using dispersal assays, prenol was evaluated for its ability to induce dispersal behaviors of four species of EPN IJs in the genus Steinernema. The sensitivity of IJs to prenol appeared to be time-dependent with regards to how long the IJs had been removed from the resource-depleted cadaver. IJs removed from the cadaver and tested 2-4 hours after collection appeared to be more sensitive to prenol as a dispersal agent (had higher levels of dispersal), while IJs that had been removed 24 hours or longer had lower levels of dispersal when exposed to prenol. The trends observed indicate that prenol may be contributing to dispersal behavior.

Karen Kong, Computer Science; Brian Crites, Computer Science  
Faculty Mentor: Dr. Philip Brisk, Computer Science  
*Reducing Microfluidic Very Large Scale Integration (mVLSI) Chip Area by Seam Carving*

This paper introduces a technique based on seam carving, an image sizing technique, to reduce the area of microfluidic very large scale integration (mVLSI) chips with a sub-optimal physical layout. Seam carving repeatedly identifies small slices of the device that can be safely removed (carved) and patched without adversely affecting device functionality. Seam carving can be applied to existing devices laid out by hand, or by sub-optimal heuristics and can generalize to an arbitrary number of device layers. Using non-linear seam carving, our most effective technique, we achieve an average improvement of 4.28x in area utilization and an average reduction in fluid routing channel length of 53%.

Renata Koontz, Physics  
Faculty Mentor: Dr. Hai-Bo Yu, Physics and Astronomy  
*Analyzing Self-Interacting Dark Matter Halo Simulations*

Astrophysical phenomena, such as the rotation of spiral galaxies, has indicated that dark matter halos that house these galaxies have a much less dense central region than the prevailing theories suggest. Previous theories have thought that dark matter particles have a very low interaction cross-section, are non-baryonic, and only interact with ordinary matter through gravity and weak forces. This model of dark matter is called collisionless dark matter (CDM). Unfortunately, on small-scale structures, CDM over predicts velocities of spiral galaxies due to its dense core. A newer dark matter model, which softens this central region, has self-interacting effects, which solves this issue of over predicting velocities. In this project, we explored the structure formation of self-interacting dark matter (SIDM) on cosmological scales. The density profiles of both CDM and SIDM, where SIDM has different cross sections, focus on the central regions and thus comparisons can be drawn. To do this, CDM and SIDM were N-body simulated and evolved over a cosmological time period. While these simulations evolved, “snapshots” were taken which gives information of every dark matter particle’s position and velocity. The information from these snapshots is used to create density profiles of SIDM and CDM. Lastly, we fit SIDM's density profile using an analytical solution of Jean's Equation to gain a better understanding of the physics.
Polybrominated diphenyl ethers (PBDEs) are prevalent flame-retardants with adverse neurobehavioral effects. In collaboration with the Huffman psychology lab, our neuroscience lab is interested in investigating changes in neuronal connectivity, particularly intraneocortical connections (INCs), within the brain and in affective and motivational behaviors in mice exposed to PBDEs during development. To explore INCs that could underlie behavioral results, developmentally dosed offspring in three experimental groups: corn oil control, DE-71 low dose (0.1 mg/Kg/day), and DE-71 high dose (0.4 mg/Kg/day). Retrograde movement of 1,1’-dioctadecyl-3,3,3’,3’-tetramethylindo carbocyanine percholate (DiI) and 4-(4-(dihexadecyl amino)styryl)-N-methylpyridiniumiodide (DiA) fluorescent dye into the fiber origins will expose possible ectopic INCs which could play an role in any aberrant behavior displayed by the offspring raised to adulthood. While future work will increase sample sizes and volumes of specific neuroanatomical regions involving social and affective behaviors, data has been obtained from DiI and DiA tract tracing of P7 PBDE exposed offspring and Sociability, Social Recognition, and Ledge behavioral tests. DiI and DiA retrograde dye tract tracing revealed wider normalized dye projection zone (DPZs): control, 43%, low dose PBDE 47% high dose PBDE 57% for frontal association cortex and oil, 39%, low dose PBDE 44%, high dose PBDE 55% for occipital cortex. PBDE offspring and controls raised to adulthood showed no significant difference in sensorimotor behaviors in the Ledge test. Future investigations will explore Suok, Forced swim, and EPM behavior of female and male PBDE exposed offspring.

Sterility in First Generation Polyploids

Polyploidy, or having more than two sets of chromosomes, has been a recurring process during angiosperm evolution that has made considerable impact on plant species diversity. An allopolyploid is a polyploid hybrid containing sets of chromosomes derived from different progenitor species. Recently formed allopolyploids are viable, but can be sterile due to atypical meiosis or other problems during embryo formation and development. Some allopolyploids become fertile and established species, as seen with *Nicotiana tabacum* (tobacco), which arose 0.2 million years ago from the diploid progenitors *N. sylvestris* and *N. tomentosiformis*. Synthetic tobacco allopolyploids were recently created in the lab from the same progenitors as *Nicotiana tabacum*, allowing us to compare the direct effects of allopolyploidy with the changes that occur in natural allopolyploids over generations. Unlike the natural tobacco, which produce an abundance of seeds, the synthetic tobacco accessions rarely produce any seeds. We are investigating why the synthetics have low fertility by asking the following questions: 1) Do the pollen tubes germinate? 2) If so, are the pollen tubes entering the ovules? To answer these questions, we stained the style and ovaries of the synthetic and natural lines with aniline blue. Our results showed that the pollen tubes were germinating, but few are reaching the ovary at four days after a flower fully opened, when compared to natural tobacco, used as a positive control. From this data, we conclude that the synthetics experience low fertility because only few pollen tubes reach the ovules and create seeds.
Sierra LaPoint, Art History/Religious Studies, Philosophy
Faculty Mentor: Dr. Matthew King, Religious Studies

*The Wheel of Time: Reflections on the Kālacakra Sand Mandala*

The Kālacakra mandala, or “Wheel of Time,” from the Tibetan Buddhist initiation rite of the same name, is a beautifully intricate construction made from millions of grains of colored sands. Its imagery is extremely complex and its creation requires incredible precision, taking many monks days to complete and amazing onlookers from every background. Over the past two years, I have studied this mandala, and the ways that people understand and interact with it. My research primarily concerns the ways different groups of individuals conceive of the mandala—what it is, and what it does, and why it is important. Through ethnographic fieldwork conducted at Du Khor Choe Ling, “The Land of Kālacakra Study and Practice,” the Dalai Lama’s North American monastery in Ithaca, New York, it has become clear that these different groups constitute distinct “publics,” discrete sets of people who are united in their use of common language for describing the mandala. These publics each relate to the mandala uniquely, raising many interesting questions about the nature of sacred objects like the mandala, and their capacity for contributing to our identities and our worlds. Because I presented on similar material last year, my presentation at this year’s symposium will consist of reflections on my fieldwork, interesting observations not addressed in last year’s formal presentation of my theoretical framework, and additional comments about the power of material culture to help shape the people we are and the worlds we inhabit.

Amber Lawhorn, Biology; Elizabeth McCarthy
Faculty Mentor: Dr. Amy Litt, Botany and Plant Sciences

*The Cellular Basis of Floral Tube Length and Width Variation in Polyploids*

Polyploidy is the process by which an organism ends up with two or more sets of chromosomes, either from one parent or two, and often leads to novel phenotypes. Within the genus *Nicotiana* (tobacco) there is a large amount of phenotypic variation in flower shape and size among the different species, many of which are polyploids, which makes *Nicotiana* an ideal genus to study the effects of polyploidy on phenotypic characters. In a previous study, we quantified floral tube length and width using *Nicotiana* allopolyploids and found that they were producing phenotypic characters that were different from their diploid parents. Here, we studied the cellular basis behind the variation in tube length and width that we saw in the allopolyploid species. We measured the cell size to see if the difference in tube length and width for the allopolyploids in *Nicotiana* was mainly due to an increase in cell size, which was expected since the genome was being doubled. In order to do this, we took floral tissue samples from *Nicotiana* polyploids and their diploid progenitors as well as a synthetic line (a first generation polyploid that was created in the lab). We stained the tissue with aniline blue to visualize the cell walls, measured the length and width of the cells, and compared this to the variation in tube length and width among the polyploids and their diploid progenitors.
Sarina Lee, Psychology; Parisa Parsafar, Psychology
Faculty Mentor: Dr. Elizabeth Davis, Psychology

The Influence of Mindfulness Meditation on Distinct Facets of Negative Emotional Reactivity

Mindfulness Meditation (MM) enhances awareness and has been associated with lower emotional reactivity. We examined how MM influences different aspects of emotional reactivity (expression and subjective intensity report) and how this might relate to the experience of emotion when discussing an evocative event later in time. 225 undergraduates were randomly assigned to listen to a 25-minute MM recording or a neutral recording (comparison condition, CC). They were then video recorded watching a negative emotional film clip. Intensity of their negative emotional expression during the film was coded offline. They self-reported the intensity of negative emotion (i.e. subjective emotional intensity) after the film and they were interviewed about the film 30 minutes later. Across conditions, greater emotional intensity immediately after the film clip was related to intensity reported immediately after the film interview (MM $r = .529$, $p < .001$; CC, $r = .701$, $p < .001$). In the comparison condition, greater emotional expression during the clip was associated with greater subjective emotional intensity reported immediately after the clip, $r = .249$, $p = .049$ and after film interview, $r = .368$, $p = .003$. These associations were not found for the MM condition. Intensity of negative emotion after the film clip was similar when recalling and discussing the negative event later. CC participants showed more emotional coherence between emotional expression and subjective emotional intensity. Discussion will focus on how mindfulness meditation may have worked to attenuate associations between negative emotional expression and subjective emotional intensity.

Laura Leger, Entomology
Faculty Mentor: Dr. Quinn McFrederick, Entomology

Transferring Microbes: Pesticide Tolerance Mediated by Pollinator Gut Microbiomes

Managed bees and wild bees frequently encounter systemic insecticides, such as imidacloprid, which travel through plant tissues into nectar and pollen. When these toxins are consumed by adult bees and fed to their developing brood, they cause significant reductions in fitness. Unlike bumblebees and other bee species, honeybees tend to show resistance to pesticides at field-realistic levels. Recent work has identified that microbial communities in honeybee guts change following host exposure to pesticides. Microbial gut symbionts are important in regulating host health because they act as the primary interface between the host and ingested pesticides. Because honeybees are naturally resistant to insecticides, we will investigate the microbial component to that resistance. We tested whether the resistant phenotype demonstrated by honeybees can be transferred to bumble bees. We inoculated bumblebees with whole honeybee guts to confer their entire microbial community. We then recorded the mortality of these bumble bees under imidacloprid challenge, and we will compare this data with mortality data from control bumblebees. To determine whether honeybee microbes can establish in bumblebees, we will extract the experimental bumblebee guts and compare their microbial communities using next generation sequencing. We expect that honeybee microbes in bumblebee guts will decrease mortality under imidacloprid stress.
Vivian Lei, Theatre  
**Faculty Mentor: Dr. Michael Bucklin, Theatre, Film, and Digital Production**  
**How a Sitcom Becomes Successful**

Situational comedies become successful due to elements in the show with which audiences can reflect and resonate. I define success in terms of popularity and high reviews and ratings. In addition, writers and producers have to consider the audience and the occurrences of the time period. My methodology consists of the textual analysis method. I will be focusing on two specific sitcoms: *Friends* and *The Big Bang Theory*. *Friends*, which premiered in 1994, echoed the 1990’s economy and rising popularity of the coffee shop culture. *The Big Bang Theory*, which premiered in 2007, reflected the renewed interest in science at that time. These two shows succeeded because they spoke to the audiences of that generation and embodied the cultural shifts. Furthermore, the shows illustrate the culture through their characters and events. Martin Gitlin articulates in his book, *The Greatest Sitcoms of All Time*, about a character’s development and influence to the audience. He states that each character is unique in personality and the relationships within the show attract audiences in seeing the characters’ social lives. My hope is that this research will benefit me as an aspiring actor in gaining knowledge of the functions in producing a successful sitcom. In addition, I hope that people outside of the field will take interest in learning the reason they may be attracted to watching sitcom shows and the benefits they can receive.

Eileen Lek, Environmental Sciences; Mixtli Campos, Chemistry  
**Faculty Mentor: Dr. Jingsong Zhang, Chemistry**  
**Construction of a Cavity Enhanced Absorption Spectrometer for HONO Detection**

Nitrous acid (HONO) is a major source of reactive hydroxyl radicals that oxidize other trace species to form ozone and peroxyacetalnitrate in the troposphere. Given that HONO plays an important role in the subsequent formation of ozone, it is critical to study its presence in the atmosphere. Thus, the development of sensitive instrumentation such as the Cavity Enhanced Absorption Spectrometer (CEAS) allows for ambient HONO detection. The CEAS construction process consisted of aligning the light emitting diode (LED) with bi-convex lenses and two high reflectivity mirrors. A helium-neon gas laser was utilized for the alignment to optimize mirror reflectivity. An adjustable iris was installed to reduce the background noise, therefore increasing the signal to noise ratio. Additionally, a flow system of N₂, NO₂, and HONO was connected to the CEAS setup for calibration. HONO was continuously generated from a reaction setup of NaNO₂, HCl, and Ar(g) and flowed into the CEAS cavity. Experiments were conducted by alternating background N₂ measurements with stepwise dilutions of HONO. By analyzing the measurements between wavelengths of 340 nm – 390 nm, the CEAS yielded a mirror reflectivity of 97.31% with the lowest HONO detection limit of 800 ppbv. In order for the CEAS to be sensitive enough to measure ambient HONO concentrations, a lower detection limit must be achieved by either reconfiguring the LED setup or adjusting the high reflectivity mirrors. Future work is focused on improving the CEAS design by identifying the factors that contribute to a statistically significant difference in the CEAS measurements.
Sareen Leon, Biology  
Faculty Mentor: Dr. Carolyn Rasmussen, Botany and Plant Sciences  
*Characterizing Kinectin Localization in Arabidopsis thaliana by Confocal Microscopy*

All living organisms undergo cell division. The highly regulated, state of cell division in non-reproductive, somatic, cells is known as mitosis. Proper progression through mitosis is critical to ensure normal growth and establishing correct cell fates in multicellular organisms. TANGLED1 (TAN1) plays a central role in determining proper cell division plane orientation. Loss of function tan1 mutants exhibit characteristics typical of cell division plane orientation defect mutants, which include crepe-like leaf texture, aberrant cell wall placement, and dwarf stature. A central focus of our laboratory is to study TAN1 and potential TAN1 interacting proteins to understand the mechanisms of cell division plane orientation.

KINETIN1 (KNN1) has been identified as a potential TAN1 interacting protein, in *Arabidopsis thaliana* (*At*). Previous research in plants and animals has shown that KNN1 localizes to the endoplasmic reticulum (ER) in plants and animals, during interphase. Our laboratory has generated lines of *At* that express fluorescent protein labelled versions of KNN1. The goal of my research project is to determine where KNN1 localizes in *At* during mitosis and interphase. I will accomplish this by utilizing our laboratory’s collection of *At* organelle markers to generate dual fluorescent protein marker lines of KNN1 with ER, microtubules, and TAN1. My preliminary data shows KNN1 perinuclear localization during mitosis. Next, I will determine if KNN1 localization changes during abiotic stress treatment. I hypothesize that KNN1 localizes to the ER during interphase, as well as mitosis, this research will further expand the body of knowledge regarding KNN1 in *At*.

Erica Li, Biochemistry; Christ Ordookhanian  
Faculty Mentor: Dr. Jeff Perry, Biochemistry  
*Rational Based Drug Discovery for Age-Related Macular Degeneration*

Age-related macular degeneration (AMD) is a common cause of blindness. Deregulation of the complement system is a primary source of the macular deterioration that leads to visual impairment. The complement system is part of the innate immune system, and is a means to enhance the internal defenses of the body by stimulating inflammation. With the over-activation of the alternative pathway (AP) of the complement system, there is perpetual inflammation localized on the macula, causing macular degeneration that leads to diminished central vision in AMD patients. The disease presents itself in the wet or dry form, with dry comprising 90% of cases, and there is no available therapy for slowing the vision loss associated with this latter form. Elevated levels of the complement protein C3d are regarded as a marker of chronic AP complement activation in both wet and dry AMD. The objective of our research is to therapeutically target C3d, which would inhibit the continuous cascade of the complement system, and thus potentially inhibit the vision loss. We have recently cloned, expressed, purified and crystallized C3d, and we are now at the stage of conducting co-crystallizations and soaks of C3d with small molecule inhibitors that were identified by computer aided drug discovery methods. We aim to determine the crystal structures of inhibitors bound to C3d to gain an atomic resolution of the interactions, as this will aid the development of high affinity, selective C3d inhibitors for pre-clinical trials.
DNA methyltransferase 1 (DNMT1) mediates maintenance of DNA methylation patterns in genome, resulting in epigenetic inheritance during cell division. Structurally, DNMT1 is composed of a replication foci targeting sequence (RFTS) domain, a DNA-binding CXXC domain, a pair of Bromo-adjacent homology (BAH) domains, and a C-terminal methyltransferase domain. Our previous structural studies of the DNMT1-DNA complex revealed that the CXXC domain and the methyltransferase domain are responsible for the interactions with unmethylated and hemimethylated CpG dinucleotides, respectively. However, the functions of the DNMT1 BAH domains remain unresolved. On the other hand, our recent study identified that the BAH domain of origin of replication complex subunit 1 (ORC1) recognizes epigenetically modified histone; such recognition is important for cell-cycle progression and body growth. Along this line, we aim to investigate the molecular interaction between the DNMT1 BAH domain and the modified histone through structural study, which promises to provide critical insights into the biological function of the DNMT1 BAH domain.

Our lab recently developed an instrument that measures the mass of small objects in fluid. The sensor consists of a glass tube that vibrates its natural resonance frequency (like a tuning fork). As an object passes through the tube, the tube’s resonance frequency inversely changes proportionally to the object’s mass. This provides a label-free measurement method that allows for continuous monitoring of virtually any sample in fluid. In this work, we show that the sensor can be applied to an important new application: measuring the controlled release rates of pharmaceuticals. We hypothesized that under different pH conditions, the dissolution rate of a drug will change. The model drug used was an over-the-counter antacid (omeprazole magnesium) in the form of delayed-release pellets inside a capsule. We observed that when the drug pellet is measured in water using our sensor, the pellet does not dissolve completely, but in a low pH fluid similar to the pH of stomach acid, the pellet dissolves at a faster rate. This research shows that our device can be used to test the controlled release of pharmaceuticals and will be useful for researchers and companies that would like to study drug release rates.
Environmental exposure to inhaled man made pollutants can cause an inflammatory response in both the pulmonary system and central nervous system (CNS). This environmentally triggered neuroinflammation correlates with increased susceptibility to neurodevelopmental and neurodegenerative disorders. Yet, few studies have defined whether exposure to common fungal antigens is able to trigger systemic allergic inflammation and induce an inflammatory response in the CNS. In Southern California, a common fungal trigger for allergies is *Alternaria*. Therefore, we chose to test whether weeklong exposure to aerosolized *Alternaria* antigens would trigger neuroinflammation in the brain as a whole, or in brain regions associated with lung function. We used qPCR to quantify regulation of microglial activation (P2Y12), proinflammatory responses (INOS, TNFa), and tissue repair/anti-inflammatory responses (Arginase I and TGFb). Currently our studies indicate that while there was no overt change in inflammatory markers in the brain as a whole, inhaled exposure to *Alternaria* antigens did trigger neuroinflammation in the brain stem. This inflammation was characterized by increased microglial activation and decreased anti-inflammatory gene expression. In aggregate, our data demonstrate that exposure to common environmental allergic triggers not only induce systemic inflammatory responses, but also responses in specific brain regions. The observed reduction in anti-inflammatory molecules suggests that these brain regions would have increased susceptibility to injury or pathogen associated brain insults.

**Leslie Lopez, Psychology**  
**Faculty Mentor:** Dr. Howard Friedman, Psychology  
**How Do University Students Think About Intensive Health Interventions? A Qualitative Study**

University students are well suited for targeted health interventions, as they are in a transitional phase of life, thus making them amenable to lifestyle changes (Anjali, 2015). Research on health interventions shows how valuable physical and mental health interventions are (Diehr, Derleth, Cai, & Newman, 2007), but research exploring participant attitudes or feelings towards these health interventions is scarce. We sought to explore how participants think and feel about different types of health interventions. In a longitudinal study, participants (N=110) were randomly assigned to one of five conditions: community garden, indoor gardening, physical activity, exposure to nature, and social film club for four weeks. Following the four weeks, participants provided qualitative responses to two questions: “What was this experience like for you?” and 2) “Has this experience changed you in any way?” For the first question, we trained three coders to rate responses for positivity, negativity, stress, and growth. For the second question, the same coders rated positivity, negativity, and time management. Using one-way ANOVAS, we did not find any significance between group differences in expressions of positivity, negativity, stress, growth, or time management. Mean scores across groups suggest that participants felt moderately positive about the intervention (3.86 on a 1-5 scale) and felt little negativity (1.39 on a 1-5 scale). These results, paired with further studies on the attitudes and thoughts of participants, can provide insight into how individuals experience health interventions. Such insight may ultimately encourage individuals to continue with their beneficial health behaviors.
Berenise Lopez, Biology; Arit Ghosh, Alexander Carrillo  
Faculty Mentor: Dr. Katherine A. Borkovich, Plant Pathology and Microbiology  
*Regulation of the bZIP Transcription Factor CPC-1 by the RACK1 Homolog CPC-2 in Neurospora Crassa*  
*Abstract*

In *Neurospora crassa*, cross pathway control is a global response in which starvation for one amino acid derepresses amino acid biosynthetic genes in multiple pathways. Expression of the bZIP transcription factor CPC-1 (Cross Pathway Control -1) is integral for transcriptional induction of amino acid biosynthetic genes including *arg-3*, *trp-3* and *his-3*, under starvation conditions. The RACK1 homolog CPC-2 is another important component of the cross pathway control network. Deletion of the *cpc-2* or *cpc-1* gene leads to slower growth and decreased induction of mRNAs for amino acid biosynthetic genes on medium containing 3-amino 1,2,4, triazole (inhibitor that targets an enzyme in the histidine biosynthetic pathway). We provide evidence that CPC-1 is post-translationally modified via SUMOylation and that CPC-2 is essential for this modification. We also demonstrate that CPC-2 is a ribosomal protein, as has been demonstrated in other systems.

Danny Luu, Environmental Sciences; Marissa Giroux, Environmental Toxicology, Sara Vliet, David Volz, Environmental Sciences  
Faculty Mentor: Dr. Daniel Schlenk, Environmental Studies  
*Effects of Climate Change and Bifenthrin on the Olfactory Behavior of Juvenile Chinook Salmon (Onchorhynchus Tshawytscha)*

Coastal waterways in California, such as the San Francisco Bay Delta, are experiencing seasonally and annually higher temperatures due to climate change. Additionally, high intensity rainfall events can cause the runoff of pesticides, such as bifenthrin. As a result, juvenile Chinook salmon (*Onchorhynchus tshawytscha*) present in these waterways are simultaneously exposed to both bifenthrin and elevated temperatures. Previous studies have shown that bifenthrin adversely affects the dopaminergic system in the central nervous system of fish. Therefore, the objective of this study was to determine the effects of temperature and bifenthrin on olfaction and general fish health. To do this, we acclimated two larval stages of Chinook salmon, alevin and fry, in 11°C, 16.4°C, and 19°C water for 11 and 14 days, respectively. The fish were subsequently treated with an ethanol control, 0.15ug/L, and 1.5 ug/L bifenthrin, for 96 hours and evaluated for predatory avoidance behavior using a Y-Maze arena and L-serine as a predatory odorant. All behavioral experiments were video recorded for later analysis along with condition factor and fish survival. Preliminary results show that both survival and condition factors decrease with increasing temperature exposure. Fish exposed to 1.5 ug/L bifenthrin also have lower condition factors at all tested temperature regimes. These results indicate salmonid health at early life stages may be impacted by both increasing temperature and bifenthrin; but the two do not appear to have synergistic effects. This study was supported by the Delta Stewardship Council Delta Science Program.
Emma Kate Mamis, Psychology  
Faculty Mentor: Dr. Imani Kai Johnson, Dance  
*Redefining Gender Roles in Same-Sex Couples in Collegiate Dancesport*

While physically challenging and aesthetically attractive, traditions of Dancesport (Competitive Ballroom and Latin Dance) reinforce heteronormative gender roles. Nevertheless, Collegiate Dancesport competitions are a subset that attempts to defy gender expectations, allowing both same-sex and gender differentiating couples to compete against the traditional male-lead/female-follow couples. Through an online survey of Collegiate Dancesport competitors/participants around the nation and an ethnography of local competitions, I explored concepts of masculinity, femininity, and gender hierarchy through the experiences of same-sex couples. Additionally, it explored how same-sex couples navigate and reconstruct these concepts through costuming, language, instruction, choreography, and the success of same-sex couples within the competitive collegiate circuit. The piece provides a comprehensive discussion of gender and dancesport practices complete with images and survey data. This project begins a discussion of gendered practices within the dancesport community. It brings together a collection of non-heteronormative dancesport experiences that may provide insight into how dancesport networks can continue to build and diversify their communities. This allows dancesport to align with the changing of norms in our social world.

Wali Mansour, Biology; Sang Nguyen  
Faculty Mentor: Dr. Emma Simmons, School of Medicine  
*Motivational Interviewing at the San Bernardino Free Clinic: Increasing Smoking Cessation, Patient Satisfaction, and Level of Trust*

In San Bernardino County, 15.8% of adults report smoking tobacco, and 9.8% of adults aged 18–64 report having active asthma, which is adversely affected by the air pollution created from tobacco smoke. The San Bernardino Free Clinic (SBFC) seeks to use Motivational Interviewing (MI) to promote smoking cessation among its low-income, high-risk patient population, thereby lowering the risk of exacerbating asthma and other respiratory conditions. The study aims to develop personalized MI sessions for patients, to facilitate intrinsic motivation to reduce smoking behaviors. After receiving standardized training in MI from a behavioral psychologist, medical students will interview SBFC patients who self-identify as smokers. Pre and post-intervention surveys will be conducted to evaluate MI efficacy. Medical students will analyze the quality of their own clinical performance while patients will address their willingness to quit smoking, satisfaction level, and level of trust toward healthcare providers. It is anticipated that a one-year intervention using MI will improve the clinical performance of medical students and increase SBFC patients’ smoking cessation, satisfaction level, and level of trust toward healthcare providers. This study will improve medical students’ clinical skills and ability to make positive long-term impacts on patients while helping to develop a future smoking cessation program for underserved patients. It will also help decrease air pollution and second-/third-hand smoke. This study’s methods can be applied to different chronic diseases at other free clinics.
Jacqueline Mantooth, Bioengineering; Dianira Erudaitius, Andrew Huang  
**Faculty Mentor: Dr. Victor G. J. Rodgers, Bioengineering**  
*Selective Glioblastoma Susceptibility to Pharmacological Ascorbate Therapy: Significance of Peroxisomal Latency*

In 2016, an estimated 23,770 people were diagnosed with brain cancer in the United States. Recent research has shown ascorbate therapy can result in reduced cellular proliferation in certain strains of brain cancer (glioblastomas), while not affecting normal cells. This outcome is a consequence of a series of chemical reactions that transform ascorbate into hydrogen peroxide (H$_2$O$_2$) which permeates the cell’s plasma membrane and, ultimately, results in DNA damage. However, there is a wide range of susceptibility for different cell lines of glioblastoma. A number of factors contribute to glioblastoma susceptibility to ascorbate. First, variations in plasma cell membrane permeability can alter the flux of H$_2$O$_2$ into the cell. Second, variations in catalase activity can alter the removal rate of H$_2$O$_2$. Lastly, variability in the peroxisomal membrane permeability, where catalase is housed, can alter the observed catalase activity (latency). In this research, we investigate the variability of peroxisome latency across different glioblastoma cell lines that have shown dramatic differences in response to ascorbate exposure. Here we determine the catalase activity, or rate of H$_2$O$_2$ consumption, when the peroxisome membrane remains intact. Additional experiments to measure the catalase activity for lysed cells (catalase free in solution) must also be done. The rates attained are then used to calculate the mass transfer coefficient for H$_2$O$_2$, which is associated with peroxisomal membrane permeability and latency. The results of this work will be used in a complete modeling analysis to further understand factors that contribute to differences in response to ascorbate therapy by glioblastomas.

Aldo Martinez, Religious Studies  
**Faculty Mentor: Deborah Wong, Music**  
*Music and the Pentecostal Religious Experience: “When the Iron is Hot, You Got to Strike”*

Music plays a major role in every religion and deeply influences individual religious experience. My presentation focuses on the effects that music has in Pentecostal churches as well as how musicians play a key role in the religious experience individuals feel during the church service. Since Pentecostal churches rely heavily on music, my ethnographic research focuses on how music and musicians influence the Pentecostal churches during the entire church service. Although this research was conducted in Pentecostal churches, the location of the churches, the language and the ethnicities of the churches was different. I will compare a Hispanic Pentecostal church in Hemet, California and a Korean Pentecostal mega-church in Seoul, South Korea. I will share ethnographic research videos to illustrate how the music creates the atmosphere for the Pentecostal experience. I compared the churches based on location and ethnicity and analyzed how the music was used in each church. Because musicians make a significant contribution to the Pentecostal church services, it is important to understand their perspective on how music affects the church service and how their music influences the religious experience that people have. In my ethnographic research, I interviewed several church musicians, and I will discuss what it means to be a “minister of music” as well as how a musician attends to the moments in a Pentecostal church service when they make their music create energy that ultimately creates the “atmosphere” that makes a church Pentecostal.
Feathers, Teeth, Tales and Temples: Ethnozoology of Bird-Like Creatures on Temple Walls in the Ancient Angkor Region

The ancient temples of the Angkor region of Cambodia are filled with artistic stone carvings of epic stories, mythic figures, and divine characters. Many of these are well studied and documented in archaeological and art history discourse. The temples themselves are global attractions for tourists, thousands of which pass through the temples every day. Despite all the activity and genuine wonder expressed by professional visitors and tourists, there are aspects of these temples and their carvings that are ignored. Among the neglected bas-reliefs are the thousands of naturalistic depictions of animals. Many of these animals are endemic to the region, including identifiable species of birds like swans, giant ibis, and peafowl. However, some of these bas-reliefs depict birds with features not found on modern birds, including long fleshy tails and fully formed teeth. Yet, those same features do match animals known in the much older fossil record from species believed to be extinct in modern literature. These birds, real or not, may have had local names that can be traced through historical records, mythic narratives, and local lore. The Khmer of the 8th and 13th centuries carved animals into the walls of their temples for a reason. Using interdisciplinary perspectives from archaeology, art history, and visual anthropology, studying these and other zoological depictions may help in reconstructing and understanding ancient Southeast Asian conceptions of ethnozoology, ecology, and environmental conservation and perhaps pose as a critique on modern understandings of zoology.

Testing for Heterodimerization of Moss Methyltransferases in Progeny of Genetically Crossed Transgenic Tobacco Plants

Sugar residues with O-methyl ether substituents occur in plant cell walls, but little is known about the function of these methylated sugars or the genes responsible for their synthesis. Arabinogalactan proteins of the moss *Physcomitrella patens* contain 3-O-methyl rhamnosyl residues not found in advanced plants. The aim of this study is to identify the gene encoding the methyltransferase (MT) responsible for synthesis of 3-O-methylrhamnose. Moss genes considered candidates for encoding this methyltransferase were transformed into tobacco. *MT1* and *MT6*, two moss genes encoding closely related proteins, were both found to cause synthesis of 3-O-methylgalactose when separately expressed in tobacco. Because no moss genes were found that cause synthesis of 3-O-methylrhamnose, the hypothesis is that when *MT1* and *MT6* are both expressed, as occurs in moss, their polypeptide products form a heterodimer enzyme that synthesizes 3-O-methylrhamnose. This hypothesis was tested by genetically crossing T1 generation *MT1* and *MT6* transgenic tobacco plants. T2 seeds were germinated on selective medium, and the T2 plants were tested for the presence of *MT1* and *MT6* transgenes and methylated sugars by PCR and gas chromatography, respectively. The T2 plants that contained both *MT1* and *MT6* were found to contain 3-O-methylgalactose but no detectable 3-O-methylrhamnose, which seems inconsistent with the heterodimer hypothesis. To further investigate the hypothesis, *mt1* and *mt6* knockout lines in *Physcomitrella* are being generated.
Steroid hormones are vital to critical organismal processes, such as development and energy homeostasis. Previously, it was believed that these hormones crossed cell membranes via simple diffusion. However, recent findings by the Yamanaka lab have provided evidence for the existence of a transporter protein required for cellular uptake of the steroid hormone ecdysone in *Drosophila melanogaster*. The active form of ecdysone, 20-hydroxyecdysone (20E), is the main hormone responsible for promoting molting and metamorphosis in all insect species. The ecdysone transporter belongs to the organic anion transporting polypeptide (OATP) superfamily. This project focuses on discovering homologous members of this transporter superfamily in the yellow fever mosquito, *Aedes aegypti*, which function as active ecdysone transporters. This is done by cloning the putative transporter genes and expressing them in human embryonic kidney (HEK) cells. A Dual-Luciferase Assay is then used to quantitatively measure the 20E transport activity of these cells, compared to those that are expressing no OATP transporters and therefore are expected to have no cellular uptake of 20E. Those transporters, which function as active 20E transporters, represent potential targets for growth disruptors against the known human disease vectors, mosquitoes.

Developing lightweight, abrasion tolerant, and fire-resistant materials is critical for the protection of lives and property from fire related catastrophes. Inspiration for these materials can be found in pyrophytic plants that have survived millennia by evolving thermal protective architectures, safeguarding their seeds and vasculature. One such thermal shield is found in the biomineralized seed coating of pyrophytes, featuring calcium oxalate platelets templated by an organic scaffold. Plants form calcium oxalate in specialized organelles to primarily regulate calcium ion content and potentially deter predators [1]. Furthermore, calcium oxalate is thermodynamically unstable and undergoes an endothermic phase change at 200°C [2]; a temperature where most plant organics begin degradation. Due to its endothermic phase transitions at high temperatures, the presence of calcium oxalate on pyrophytic seed surfaces points to a previously undescribed utility - an energy-absorptive protective barrier.

Using Scanning Electron Microscopy, powder X-ray diffraction, and Fourier Transform Infrared spectroscopy, we determined that the seed coating featured tetragonal calcium oxalate platelets (monohydrate phase). By contrast, in our comparative controls, which include seeds from non-fire resistant plants, we observed that calcium oxalate platelets of similar morphology were covered in a thick sheath of epicuticular organic. After heating the seeds to multiple temperatures and observing structural and chemical variations, a positive correlation was found between the calcium oxalate phase transitions and survival of organics for temperatures up to 350°C. Therefore, our analyses help identify and characterize a unique energy-absorptive biomineralized seed coating that potentially acts as a final line of defense against forest fires.
Paul Medina, Cell, Molecular, and Developmental Biology; Dihong Lu, Dennis Chang  
Faculty Mentor: Dr. Adler Dillman, Nematology  
Investigation of How the Entomopathogenic Nematode Heterorhabditis bacteriophora Suppresses the Host Immune System

Entomopathogenic nematodes (EPNs) are insect parasites often used in pest management. The infective juveniles (IJ), which is the only free-living stage and analogous to the dauer stage in C. elegans, is associated with pathogenic bacteria, which they carry in their gut. Developmentally arrested IJs invade insect hosts and initiate the parasitic part of their life style by releasing pathogenic bacteria from their gut. It is widely believed that the bacteria kills the insect hosts and then proliferates, supporting the nematode growth and reproduction. However, it has been shown that EPNs in the genus Steinernema contribute to pathogenesis through their secreted products, to manipulate host immunity and promote bacterial growth. Our poster discusses the hypothesis in Heterorhabditis bacteriophora, an EPN species that is widely used in both research and pest control. We have adapted a method to obtain large amounts of bacteria-free IJs by culturing nematodes on a non-colonizing bacterial strain. We have developed a method to activate the IJs in vitro and are currently harvesting secreted protein products from activated IJs. The goals are to determine whether H. bacteriophora nematodes secrete active products to modulate host immune system and to characterize these components, focusing on the protein products.

Yesica Mercado-Ayon, Cell Molecular and Developmental Biology; An-Phong Nguyen, Biology; Lichao Li, Genetics Genomics and Bioinformatics  
Faculty Mentor: Dr. Weifeng Gu, Cell Biology and Neuroscience  
Dissecting the Role of DRH-3 in RNA Interference in C. elegans

RNAi plays crucial roles in regulating many important biological processes using short interfering (siRNAs). In C. elegans, siRNAs are generated using template mRNAs and non-coding RNAs by a complex containing RNA-dependent RNA Polymerase (RdRP) and DRH-3, Dicer Related Helicase. Our previous observations indicated that DRH-3 is essential to the biogenesis of siRNAs mapped to the 5’ UTRs and the protein coding regions but not to the very 3’ end of 3’ UTRs. We speculate that DHR-3 unwinds the siRNAs generated by RdRP and facilitates the loading of siRNAs into Argonautes including WAGO-1 and/or WAGO-9 (Model 1). Without DRH-3, siRNAs are only generated at the 3’ UTRs but cannot be unwound and loaded into Argonautes, and as a result, RdRP cannot move along the template RNAs. An alternative model suggests that DRH-3 is required to unwind mRNA secondary structure ahead of RdRPs to allow the translocation of RdRPs. Without DRH-3, the 3’ siRNAs are still only generated in 3’ UTRs but can be loaded into Argonautes. To distinguish these two models, we generated two drh-3 mutants with a transgene that contains either a FLAG-tagged WAGO-1 or FLAG-tagged WAGO-9, both of which binds DRH-3 dependent siRNAs in wild type cells. Using immunoprecipitation followed by high-throughput sequencing, we aim to detect whether the siRNAs bind these two Argonautes in the drh-3 mutants. We have generated these strains, performed the immunoprecipitation, and created the high-throughput sequencing library. We are performing high-throughput sequencing and will analyze the data.
Ena Mikic, Materials Science and Engineering; Sarah Allec, Materials Science and Engineering
Faculty Mentor: Dr. Bryan M. Wong, Chemical and Environmental Engineering

GPU-enabled Real-time Electron Dynamics of Nitrogen-doped Graphene Nanoflakes

Since its isolation, graphene has become one of the most promising materials of the twenty-first century, particularly for next-generation electronics. Because silicon-based electronics face fundamental limitations at the nanoscale, preparing graphene for use in next-generation carbon-based nanoelectronics has been the focus of intense research. One of the most powerful and feasible methods of tailoring the properties of graphene is by doping with foreign atoms. Nitrogen, with a similar size to carbon but with one more electron, is expected to form donor states in graphene as a substitutional dopant; however, experimental measurements of N-doped graphene reveal the existence of several nitrogen configurations with distinct electronic properties. In particular, one can tune the charge carrier concentrations by controlling these dopant bonding configurations to chemically transform graphene into a p-type or n-type semiconductor. While there have been previous experimental and theoretical results for nitrogen-doped graphene, there has not been a systematic study of these materials at the nanoscale, where optoelectronic properties will be heavily governed by doping density and quantum confinement effects. To this end, we have carried out a theoretical investigation of nitrogen-doped graphene nanoflakes via a new real-time time-dependent density functional tight binding (RT-TDDFTB) code that runs on massively-parallelized GPUs. This GPU-enhanced capability allows us to efficiently and accurately calculate the electron dynamics of these systems (~1400 atoms) at a quantum mechanical level, whereas conventional approaches are computationally limited to only hundreds of atoms.

Kimberly Miller, Linguistics and Psychology
Faculty Mentor: Dr. Curt Burgess, Psychology

Measuring a High Dimensional Memory Model’s Ability to Distinguish between Instrument and Manner Verbs

This research investigates Levin’s (1993) methodology of categorizing verbs into grammatical classes. We used the Hyperspace Analogue to Language (HAL; Lund & Burgess, 1996) semantic model, which has been able to categorize grammatical distinctions such as those between a noun and a verb, or even the more subtle manner of motion and inherently-directed verbs. In earlier research (Miller, 2016), we had utilized this model to test its ability to differentiate between different levels of linguistic granularity. Following Levin’s (1993) theory, we evaluated HAL’s ability to categorize coarse, medium, and fine-grained classes. As the subclasses became increasingly fine grained, the words were scarcer, in making it difficult to test. We were unable to find a reliable difference in semantic density with the model. However, this research uses verbs that might better demonstrate the levels of granularity because more items can reduce the variability within the class. We used the wipe alternation as our coarse grained verbs. We used 15 instrument subclass and 15 manner subclass verbs all from the wipe verb category. We used the vector representations from the model and submitted these a MDS visualization analysis. These results will be presented at the symposium.
Directly emitted air pollutants react with atmospheric oxidants such as hydroxyl (OH\textsuperscript{•}) radicals to form secondary organic aerosols (SOA). This uncontrolled, multigenerational oxidation in the atmosphere yields secondary products that form SOA species. The optical properties of SOA are not well characterized although SOA species contribute to a significant amount of direct radiative forcing. In addition, it is uncertain how stable the absorbing components of aerosols are in the presence of sunlight. In this investigation, we considered the oxidation of 1-methylnapthalene and the changes in optical properties of SOA aged in the presence and absence of black lights. SOA reactions with varying light intensities were measured and compared with experiments where lights were constant after the injection of 1-methylnapthalene. We used a 2 m\textsuperscript{3} Teflon chamber flanked with black lights at the peak radiation of $\lambda = 350$ nm; OH\textsuperscript{•} Radicals were generated from the photolysis of H\textsubscript{2}O\textsubscript{2}. In these experiments, we measured aerosol absorption and scattering coefficients at 375 nm, aerosol size distribution and composition, and concentration of gas phase tracers. To characterize the differences in gas phase oxidation conditions among different experiments and the subsequent changes in aerosol composition, we compared the decay rate of 1-methylnapthalene and investigated changes in the oxidation state of carbon in SOA. The oxidation state of carbon was then related to the optical properties and mass absorption efficiency.

Zoya Mirza, Neuroscience; Vanessa Ledesma, Mayur Upparapalli, Matthew Rios, Michelle Alva, Andrea Takahesu Tabori  
Faculty Mentor: Dr. Judith Kroll, Psychology  
*Investigating How Second Language Age of Acquisition Affects Language Learning and Generalization*  

Research has shown that bilingual experience holds consequences for new learning. Adult bilinguals have an advantage learning words in a new language compared to monolinguals (e.g. Kaushanskaya, 2016). Moreover, learning two languages early in life may require special tuning that is beneficial for learning and the extension of that knowledge. Infants with dual language exposure display an enhancement in flexible rule learning in both language and domain-general tasks (Kovácks & Mehler, 2009). They can also generalize earlier in development than monolingual infants (e.g. Brito & Barr, 2012). We hypothesize that early bilinguals may have an advantage in learning and generalization relative to monolinguals and late bilinguals.

The current study tests this hypothesis by comparing the learning and generalization abilities of three groups of adults: English monolinguals, early, and late Spanish-English bilinguals. In a suffix learning task, participants studied novel words along with their definitions. The words contained a familiar stem and a novel suffix (*bricknule: someone who works at a brick factory*). After learning, participants completed a recognition task as well as language and cognitive measures. A week later, participants completed the generalization task while their brainwaves were recorded via electroencephalogram (EEG). The generalization task involved reading sentences that ended in a novel word containing one of the learned suffixes (*dreefnule*), which were either semantically congruent or incongruent with the sentence. Accuracy and reaction times are the behavioral indices of generalization, and Event Related Potentials (ERPs) will also be examined as a measure of generalization.
Jose Luis Montano, Chemistry; LiangYong Mei
Faculty Mentor: Dr. Joseph Genereux, Chemistry
*Specific Composition Dependence of Molecular Chaperones DnaJ/HSP40 for Productive Protein-substrate Interaction*

It is well known that molecular chaperones play crucial roles in maintaining cellular proteostasis by aiding nascent protein in attaining functional conformations, preventing protein aggregation and facilitating protein degradation. When subjected to environmental stress (i.e. heat shock, pH shift, hypoxia), misfolded non-native protein become more prominent, which may lead to toxic conditions for the cell. This can then give rise to a number of age-onset neurodegenerative disorders, including Huntington’s Disease (HD), Alzheimer’s Disease (AD), Parkinson’s Disease (PD), prion diseases and Amyotrophic Lateral Sclerosis (ALS). Specialized chaperones, termed Heat Shock Proteins (HSPs), are up-regulated in response to such levels of stress. The *dnaJ*/HSP40 chaperones are a family of HSP’s that are characterized by a highly-conserved J-domain, but vary greatly outside of this domain, making it a potentially diverse family of chaperones and co-chaperones with extensive functionality. Our research is aimed at identifying which domains of various *dnaJ* proteins in transfected HEK293T cells are dispensable to the client binding properties of the chaperone. Domains will be selectively truncated with Polymerase Incomplete Primer Extension (PIPE) to attain a minimal structure with binding properties. With this, we hope to learn which domains are crucial for productive protein-substrate interactions in order gain a deeper understanding of the composition dependence and relative substrate profiles of a series of *DnaJ*/HSP40’s.

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Emily Moorhouse, Psychology; Grace Hanley, Tara McCoy
Faculty Mentor: Dr. William Dunlop, Psychology
*Intrinsic and Extrinsic Motivation within Contextualized Goals*

This project assessed the intrinsic and extrinsic motivations of college students within various domains, via a consideration of goals. One hundred fifty-seven participants provided lists of goals pertaining to their roles as a student, friend, and offspring. These goals were then coded for the presence/absence of intrinsic and extrinsic motivation. Goals in the friend domain evidenced significantly higher levels of extrinsic motivation compared to the offspring and student domains whereas goals in the student domain evidenced significantly higher levels of intrinsic motivation compared to the friend and offspring domains. Extrinsic motivation across the relational domains of friend and offspring were positively associated with each other, though they were not related to extrinsic motivation levels within the professional domain of student. Extrinsic motivation was positively related to prevention orientation within the friend domain. These findings illustrate the domain-specific nature of motivational orientations.
Kevin Mortazavi, Neuroscience; Mellonie Zhang, Biochemistry

Faculty Mentor: Dr. Nicholas DiPatrizio, Biomedical Sciences

Impact of a Western Diet on Lipid Signaling Molecules in the Left ventricle of Diet-Induced Obese Mice

The majority of American adults are considered overweight and over a third suffer from obesity, which has been causally linked to cardiovascular disease, resulting in 31% of all deaths worldwide. We require a better understanding of the underlying biochemical processes that affect heart health in obese individuals. Endocannabinoids are a class of lipid signaling molecules that regulate many physiological processes, including cardiovascular function and energy balance. However, the effects of western-diet induced obesity on the endocannabinoid system and resulting cardiovascular function remains largely unknown. This project investigates changes in the production of the lipids, 2-AG, AEA and OEA, in the left ventricle of lean mice maintained on a standard diet (SD) and diet-induced obese mice maintained on a Western Diet (WD) for 60 days. These lipids were extracted from the left ventricle of the heart of both males and females via lipid extractions, and subsequently analyzed using Ultra-Performance Liquid Chromatography/Tandem Mass Spectrometry. In contrast to SD mice, we generally found significant increases in AEA and OEA levels in the left ventricle in WD conditions. This research leads us to conclude that there is a diet-dependent endocannabinoid response in the left ventricle of western diet induced obese mice. Further exploration is needed to better understand the biochemical processes involved in this endocannabinoid response and its physiological relevance to cardiovascular disease. Doing so can help identify sites for drug intervention that can lead to a higher quality of life and better heart health in individuals susceptible to obesity related heart disease.

Rainita Narender, Psychology; Dakota Salazar, Neuroscience; Elizabeth A. McDevit

Faculty Mentor: Dr. Aaron Seitz, Psychology

Does Napping Boost Benefits of Brain-training for Working Memory?

Working memory is the primary mechanism enabling humans to store new information while retrieving relevant information for application to a particular task. According to recent studies, brain-training regimens may enhance an individual’s overall working memory capability. Additionally, sleep may facilitate consolidation of newly learned information and skills. Here, we asked if napping could boost benefits of brain-training for working memory. Eight participants completed ten days of training on an n-back task in one of two conditions: nap and no-nap. The no-nap group completed two 20min training sessions per day (total 40min/day); the nap group completed one 20min training session followed by a 30min nap opportunity each day. We examined the highest n-level achieved each day to determine if napping is an effective substitute for additional brain-training. On average, the nap group slept 16.0±7.4 minutes (84% light sleep, 12% deep sleep, 4% REM sleep). A mixed-model ANOVA showed that, overall, performance improved across ten days of training (p<.001). There was no main effect of group, but the day x group interaction was trending (p=.06). Post-hoc t-tests showed that performance did not differ between groups on training Day1 (p=.44), but by Day10 the no-nap group outperformed the nap group (p=.01). In summary, these results indicate that two training sessions/day may yield a greater improvement in working memory compared to one training session plus a nap. For people looking to dedicate time each day to improving their working memory, it may be more beneficial to spend the entire time training rather than training+napping.
Celeste Navas, History  
**Faculty Mentor: Dr. Dana Simmons, History**  
*The Containing Spaces of Experiments: US Cold War influence in Guatemala through Medical Research*

This historical research paper examines the complex medical and political roles that the US Health Services played in Guatemala during the early Cold War period. At the same time the United States is implementing the policy of containment, a policy to contain communism from spreading in the western hemisphere, the Public Health Services is conducting medical experimentation to contain venereal disease. It was against this background that containment transformed medicine in a radical way. To construct this argument, I draw upon the Dr. John C. Cutler records that include unpublished reports, journals, surveys, and photographs. Some view doctors, public health services, or government elites as the agents driving medical change, but typically these groups use vulnerable people as leverage to benefit a privileged population. In addition, I use a Science and Technology Studies (STS) approach by casting the venereal disease, nonhuman subjects, and movement of time and space in the experiment within Guatemala through the provocative nonhuman analysis. The Guatemalan syphilis experiment attempted to find penicillin to be the solution to the pressing problem of U.S. military medicine. However, these experiments resulted in violent and dehumanizing procedures of coerced sexual intercourse and direct inoculation of venereal disease that led to syphilis infected bodies and death of Guatemalans.

Brandon Ngo, Biology  
**Faculty Mentor: Dr. Rebekah Richert, Psychology**  
*The Differences in STEM Feelings and Interest between Boys and Girls*

According to the National Science Foundation, there is far less representation of females compared to males in STEM fields (NSF, 2014). This shortage may originate in females’ childhood due to lack of positive feelings and interests in STEM. This research aims to understand children’s feelings and interests in STEM. Children’s prior exposure to or experiences with STEM may influence how they play STEM games (Meluso, Zheng, Spires, & Lester, 2012), however playing a STEM game also may positively influence children’s feelings and interests toward STEM (Meluso et al., 2012). Thirty (30) participants (53% males) were interviewed, and children’s feelings and interests pre and post-playing a STEM game on an iPad were measured using self-efficacy questions and a STEM interest scale. Results indicate a significant decrease in STEM interest from pretest ($M = .779$, $SD = .289$) to posttest ($M = .663$, $SD = .428$), $t_{(29)} = 2.164$, $p = .039$. Children’s self-efficacy did not significantly differ from pretest to posttest, $t_{(29)} = - .328$, $p = .745$. Overall, these findings indicate children lose interest in certain STEM activities and have no differences in their self-efficacy for a specific STEM game.
RNA binding proteins (RBPs) are involved in the post-transcriptional control of RNA and regulate gene expression throughout development. Although RNA binding proteins independently have undergone thorough investigation, the interactions between RBPs remains largely unknown. In this study, we focused specifically on two well-characterized RBPs, Argonaute (AGO) and Pumilio (PUM). Argonaute is a protein involved in the RNA silencing process and plays an essential role in the RNA-induced silencing complex (RISC), which is responsible for RNA interference (RNAi). Pumilio is involved in mRNA regulation via inhibition of ribosome assembly, destabilization of the 5’-cap binding complex, and recruitment of 3’ deadenylation factors. Utilizing data obtained from CLIP(cross-linking immunoprecipitation)-sequencing, we isolated regions in the 3’UTR (untranslated region) containing both AGO and PUM binding sites. In order to obtain a frame of reference to compare with the wildtype sample, we constructed samples where the binding site of AGO was inhibited, preventing the binding and expression of the RBP. Measuring the activity of the wildtype and mutant cells through luciferase assays, we were able to identify cases of both antagonistic and cooperative behaviors between the two individual RNA-binding proteins. The varying interactions were thought to be highly dependent upon the context of the 3’ UTR region. In order to fully elucidate the conditions that determine whether the relationship between RBPs is antagonistic or cooperative, we intend to continue test their interactions in varying conditions.

Johnny Nguyen, Psychology
Faculty Mentor: Dr. Kate Sweeney, Psychology
The Role of Positive Emotions in Times of Stress, Anxiety, and Uncertainty

Uncertainty about the future is usually stressful. In particular, people awaiting uncertain news (e.g., the outcome of a job interview or medical test) typically experience high levels of anxiety that negatively affect their well-being and even their physical health. Previous work has established a link between stressful experiences of uncertainty and both sleep disruption and poor health, so a crucial next step is identifying ways people can buffer themselves from these deleterious health effects. In the present study, we examined the role of positive emotions in promoting healthy behavior during a period of stressful uncertainty. In accordance with Fredrickson’s broaden-and-build theory, we hypothesized that positive emotions may undo the link between uncertainty and negative health effects by promoting adherence to beneficial health behaviors. Law graduates (N = 150) taking the California bar exam in July 2016 reported their positive and negative emotions and their practice of healthy behaviors while they were studying for the exam and during the wait for exam results. All measures had adequate reliability. Bivariate correlation analyses confirmed that participants who reported more positive emotions engaged in more healthy behaviors both while studying for the bar exam, $r (150) = .22$, $p < .01$, and while they awaited their exam results, $r (131) = .18$, $p = .04$. Negative emotions were unrelated to health behavior, $rs < .10$, $ps > .22$. These findings suggest that positive emotions play a unique role in promoting healthy behavior during both periods of stressful preparation and stressful uncertainty.
This study investigates the possible neuroprotective role nicotine plays in health and survival of pluripotent stem cells and subsequent stages of neurogenesis. To evaluate this hypothesis, the effects of nicotine exposure, at varying concentrations, are being examined by employing a toxicology/disease-in-a-dish model using normal/healthy human embryonic stem cells (hESC). Evaluations are also being made between hESC and normal/healthy induced pluripotent stem cells (iPSC), as well as induced pluripotent stem cells from (iPSC) Huntington’s Disease patients. Data are being gathered by combining live cell imaging techniques with video bioinformatics software to produce a novel and powerful analytical tool for mining data from time lapse images. For exposed hESC, data demonstrated reduced cell death in nicotine treated colonies; however, a lack of difference in colony growth between control and treated cells may indicate effects on growth rates. For comparison experiments using all three cell types, data showed that normal/healthy hESC and the Huntington’s Disease model iPSC react similarly between cell types while the normal/healthy iPSC behave differently. These data may indicate a need to replace these control iPSC with another line of control cells. Due to the complexity of time-lapse video images, it is often very difficult to fully extract data using the naked eye. The use of bioinformatics software has helped immensely to improve data generation but, the ability to multiplex feature of interest, such as cell death and growth, has allowed for even more in depth data analysis, revealing minor changes that would have otherwise been missed.

Katherine Noble, Computational Mathematics
Faculty Mentor: Dr. Curt Burgess, Psychology
Comparing Computational Models of Semantic Memory

Two computational models of semantic memory, Hyperspace Analogue to Language (HAL) (Lund & Burgess 1996) and Latent Semantic Analysis (LSA) (Landauer & Dumais 1997) model word meaning and compute semantic similarity of words. For example, “boy” and “girl” are closer in the semantic space of the models than “boy” and “table.” This is analogous to human performance in the semantic-priming task where a subject is faster to respond to a word when it is preceded by a related word. These models are similar in that they analyze text corpora and compute lexical co-occurrences as the model moves through the corpus. The result is a similarity metric that correlates with human performance. This metric is a distance measurement in HAL and a cosine in LSA. The research will evaluate the ability of both HAL and LSA models to predict human results. Rubin et al (2014) compared these models and concluded that the HAL model better mimicked semantic relatedness, but the LSA model was more accurate for associative relatedness. This research used artificial corpora. In my research, the models were trained on corpora of hundreds of millions of words of natural language and tested with word pairs that have been used in human research. If the Rubin et al results are replicated, HAL should show strong semantic priming and weak associative priming while LSA should show the opposite pattern. The results will be discussed in the context of the mechanism of concept acquisition and provide additional evidence using a large corpus of language.
Cebrina Nolan, Entomology, Dr. Ryan Arvidson, Entomology  
Faculty Mentor: Dr. Michael E. Adams, Entomology and Cell Biology & Neuroscience  
Adenosine Deaminase Activity in the Parasitoid Jewel Wasp and its Possible Role in Inducing Hypokinesia in Host Brain

The emerald jewel wasp *Ampulex compressa* famously induces a compliant, hypokinetic “zombie” state in its host, the American cockroach *Periplaneta americana*, through injection of venom into the central nervous system. A unique feature of this altered behavioral state is its week-long duration period. After, the stung animal fully recovers if egg deposition by the wasp is prevented. As a prelude to elucidating the biochemical basis for the induced hypokinetic state, we used a combined transcriptomic and proteomic approach to generate a comprehensive venom proteome consisting of over 200 components. Using this approach, we found a significant presence of adenosine deaminase within the venom of the wasp.

Functional analysis of venom adenosine deaminase reveals its time-dependent role as an antagonist of the adenosine receptor *in vitro*. We are currently investigating how venom adenosine deaminase injection into the cockroach brain contributes to hypokinesia.

Our research promises to provide new insights into the role of adenosine deaminase as a novel venom component causing behavioral alteration in an envenomated host insect.

Israel Nunez, Neuroscience; Zhelin Li  
Faculty Mentor: Dr. Sika Zheng, Biomedical Sciences  
UV Radiation Induced DNA Damage Response is Exacerbated in NMD Deficient N2A Cells

DNA damage and transcription errors are known to incite mutations and chronic diseases. Cells have evolved mechanisms such as nonsense mediated RNA decay (NMD) and DNA damage responses (DDR) to prevent mutations and respond to anomalous damage to the transcriptome and genome, respectively. NMD is a crucial post-transcriptional mechanism that maintains the fidelity of the expected cellular gene expression by removing harmful mutated RNA transcripts containing a premature stop codon. It has been shown to be associated with muscular dystrophy, cystic fibrosis and other diseases. DDR are all mechanisms used to maintain the cell’s genome integrity and function against DNA damaging agents such as UV radiation, chemical exposure, and replication errors. To unravel the suspected interaction between NMD-DDR cellular quality control mechanisms, we used UV irradiation to induce DNA damage in NMD deficient cells and compared DDR against control cells. The DDR activity was determined by measuring γ-H2AX, a DDR biomarker, via western blot. We found that a decrease in NMD activity can exacerbate DDR in the form of γ-H2AX upregulation under UV induced DNA damage. Understanding the connection between NMD and DDR is crucial in the discovery of cell’s capabilities to cope with genomic damages and could lead to advancements in cellular responsiveness to neurodegenerative diseases and cancers.
Phoebe Nye, Biochemistry; Tabitha Miller, Lauren Holloway  
Faculty Mentor: Dr. Richard Hooley, Chemistry  
*Effect on Self-Assembled Cages with Multicomponent Variation*

Self-assembled cages have great potential as biomimetic catalysts. Many types of self-assembled cage complexes are known, but most of them display incompatible substrate reactive cavities due to the limitation of the cage size. To solve this, I will incorporate variable coordinating groups to construct scaffolding ligands to form cavity-containing tetrahedral or even cubic cages. The cage is synthesized by multicomponent self-assembly of functionalized diamine containing ligands, such as Diaminosuberone, Diaminosuberol, and Diaminosuberenone with pyridinecarboxaldehyde and quinolinecarboxaldehyde, and coordinating metal ions, such as Iron, Zinc, and Cadmium. By switching out the aldehyde ends attached to the ligands and the coordinating metals, we can observe how these changes impact the ability for the cages to self-assemble as well as how their geometric shapes are affected. The success of the cage assembly will be determined using Nuclear Magnetic Resonance (NMR), Mass Spectroscopy, and X-ray crystallography.

Stellamaris U. Ohakamnu, Biology  
Faculty Mentor: Dr. Jon A. Willits, Psychology  
*Using Linguistic Analyses to Predict and Understand Schizophrenia Outcomes*

One reason mental disorders are difficult to diagnose and treat is difficulty pinpointing specific problems in highly complex mental disorders. One potential source of information is a patient’s language use, which can be used to understand and analyze an individual’s mental thoughts. The purpose of our project was to test whether we could classify people with schizophrenia as a function of their language use. Patients diagnosed with schizophrenia were interviewed, along with a control group of patients with non-mental illnesses such as diabetes. Every patient was asked the same set of questions, such as telling their life story. We used a program called Linguistic Inquiry and Word Count (LIWC), which allows researchers to analyze text by placing words in specific psychologically appropriate classifications (Tausczik & Pennebaker, 2010). We used this program to look for patterns distinguishing the speech of schizophrenic and control patients. Our analysis showed that people with schizophrenia were less likely to use sexual, biological, body, health, and ingestion related words. This can mean that patients with schizophrenia tend to not focus on their mental or physical disabilities and are less inclined to have sexual thoughts. The data also revealed lower usage of certain grammatical words (such as conjunctions and auxiliary verbs) in patients with schizophrenia, demonstrating less usage of descriptive words and phrases, and lower tendency to form complex sentences structures. These differences demonstrate how linguistic analysis helps understanding mental illnesses such as schizophrenia, and may be useful for helping identify people at risk for schizophrenia.
Environmental racism functions as an injustice that is a result of structural and institutionalized racism. By definition, environmental racism is the 'disproportionate exposure of ethnic minorities to pollution as a result of poverty and segregation that has relegated many blacks and other racial minorities to some of the most industrialized and dilapidated environments.' These injustices, both carried out on a national and international level, perpetrate systemic oppression—as evidenced by our sending of waste to the Third World and the Flint Water Crisis. One key idea that will be addressed is how much more timely government responses would be given an environmental crisis in a more affluent community. Heavily polluted, mostly-minority areas such as Cancer Alley (Louisiana) and Chester, Pennsylvania will also be in my center of focus as the thesis will then point to how environmental racism contributes to disparate health effects suffered by minority communities. Accordingly, I would have to control for extraneous factors, as correlation does not equate to direct causation. Looking into the state of health of minority communities as opposed to the state of health in more affluent communities (still controlling for outside factors) would help to conceptualize whether the findings present any correlation to the proximity to toxic chemicals and dilapidated environments. The cumulative impacts that detail the effects of combined results of the past, current, and future activities on the environment will be assessed. Robert Bullard's book 'Confronting Environmental Racism' among a variety of other sources for research will be cited.

Studies have shown that the dimethysulfoxide reductase (DMSOR) from *R. sphaeroides* remains catalytically active when the molybdenum ion in the active site from the native is substituted with tungsten (W). The tungsten-substituted DMSOR (W-DMSOR) has been investigated to compare its catalytic activity with the wildtype Mo-DMSO. Kinetic studies show that the W-DMSO is more active than native Mo-DMSOR in catalyzing the reduction of DMSO. At pH 6 the $K_{cat}$, 1100 s$^{-1}$, is 20-fold greater than the Mo-DMSOR. Stopped-flow experiments of the dithionite reduced W-DMSOR at different concentrations of DMSO reveal the existence of an intermediate with an absorption spectrum similar to that seen with the native Mo-DMSOR. EPR studies of this intermediate species indicate that it is in the one-electron reduced W(V) state. Experiments with examining the effect of product DMS on oxidized W-DMSOR show that DMS accumulating in the course of turnover does not rebind to the oxidized W-DMSOR, as is seen with the native Mo-DMSOR. This is consistent with the known lower reduction potentials of W-DMSOR compared to the native Mo-DMSOR.
Marc Pajarillo, Biology; Rosie Oshana, Stephanie Gamez, Anna Buchman
Faculty Mentor: Dr. Omar Akbari, Entomology

Comparing Drug Inducible Systems in Drosophila Melanogaster

Insect borne diseases continue to be a global health concern as they continue to stifle entire communities. The prospect of saving millions of lives through suppression of disease vectors is of major interest. Regulating gene expression is a mechanism that poses great potential in managing the populations of prominent vectors such as mosquitoes by disabling expression of essential genes. In a published study, Oxitec has shown the tetracycline operon system being used as an efficient means to suppress mosquito populations. The aim of this project is to compare different drug inducible operon systems similar to the tetracycline system in the model organism, Drosophila Melanogaster. These systems include the VanR, CymR, TtgR, PipR, and lacO systems. We designed several transgenic fly lines that express a transactivator (driver) and luciferase gene (responder) for each system. From there, we set up experimental crosses between the driver and responder to obtain flies expressing both components. When both components are present in the fly, a luciferase reporter gene is expressed. Levels of expression can then be quantified by measuring luciferase activity in the hybrid progeny. Expression of luciferase in these systems can be controlled by introducing a drug appropriate for each system that represses the expression of the reporter gene. These results will provide a template for designing an effective and safe Release of Insects with Dominant Lethal (RIDL) system that can be used for insect vector control.

Lipsa Patel, Biochemistry; Maneeshi Prasadm, Biomedical Sciences
Faculty Mentor: Dr. Martin Garcia-Castro, Biomedical Sciences

Determining the Stem Cell Potential of Neural Crest During its Specification From Embryonic Stem Cells

Neural crest (NC) cells are an embryonic stem cell population that gives rise to much of the craniofacial skeleton and peripheral nervous system, as well as pigment cells and smooth muscle cells in a developing embryo. Studies in chick embryos have demonstrated that specification of NC occurs during early gastrulation and multiple NC factors are known to play distinct roles at different stages of NC development. Studies in our lab have identified that NC cells are specified as early as the blastula stage of embryonic development prior to germ layer formation. To distinguish the potential of perspective NC cells from the embryonic stem cells (ES), we challenged the perspective NC to form the germ layers, mesoderm and endoderm. For this study, we utilized the human NC model system, which we have previously engineered, as a fast and robust model of human NC development based on human ES cells. We performed experiments using mesoderm and endoderm inducing growth factors to analyze the expression of mesendodermal markers such as BraT, Tbx6L, Sox17 and EOMES. Our analysis will demonstrate the distinct potential of NC from the ES cells state, thus, providing a great tool for generating several NC derivatives for transplantation therapies.
Microsoft's Paradigm Shift: Strategically Reinventing the Brand, Supporting its Vision for Growth, and Strengthening its Competitive Position

Microsoft is a leading multinational technology company that has thrived on its flagship software products Windows and Office. Although, under Steve Ballmer’s conservative leadership, the company lacked the ability to shift to emerging consumer trends. As a result, the company’s stock prices hovered at the same price for over a decade. This research presentation aims to identify a new era for Microsoft under CEO Satya Nadella’s innovative leadership and vision for growth. Microsoft’s strategic vision aims to invest in diversified business avenues such as cloud computing and hybrid hardware devices to rebrand the company as a software and hardware provider. This presentation will illustrate how Nadella’s newfound executive leadership has revitalized Microsoft’s corporate culture, investor confidence and momentum to strategically capitalize on new windows of opportunity. This corporate analysis demonstrates a holistic assessment regarding Microsoft’s shift away from its myopic thinking in order to capture emerging consumer trends that will drive future business outcomes. Through this analysis, I aim to illustrate Microsoft’s ability to reinvent itself through newfound agility and strengthened decision making to improve Microsoft’s long term profitability, market penetration and brand value. My main objective is to highlight Microsoft’s promising paradigm shift and its capacity to diversify its product portfolio to sustain a competitive advantage within the market.

Pedro Peña, Chemistry
Faculty Mentor: Dr. Ludwig Bartels, Chemistry
Optoelectrical Characterization of MoS$_2$

Since the discovery of graphene, 2D materials have been extensively researched. Unlike graphene, transition metal dichalcogenides (TMDs), such as molybdenum disulfide (MoS$_2$), exhibit a direct bandgap at the monolayer limit. This makes them ideal for optoelectronic devices. We utilize chemical vapor deposition (CVD) for the growth of monolayer MoS$_2$, which we characterize by scanning photocurrent microscopy (SPCM). By optically exciting the MoS$_2$ devices, we study the photoconductive nature of the material. Preliminary results show that photocurrent is localized near the contacts, showing that these contact-material interfaces play a large role in these 2D materials.

Louis Penafiel, Physics and Pure Mathematics
Faculty Mentor: Dr. Owen Long, Department of Physics and Astronomy
Search for Gluino Production Using Quark/Gluon Discrimination in PP Collisions at 13 TeV

We present studies of applying quark/gluon discrimination in the context of searches for gluinos with data from the Compact Muon Solenoid experiment at CERN’s Large Hadron Collider. This analysis contributes to searches for evidence of supersymmetry, which solves three fundamental problems in physics: the hierarchy problem, possibility for Grand Unification, and explanation for dark matter. We compare the sensitivities of an established search with a search that utilizes the additional information from quark/gluon discrimination. Results are shown for several simplified model signal topologies.
The Prevalence of Intimate Partner Violence in University Students and Its Association with Anxiety and Depression Severity

While studies have previously examined Intimate Partner Violence (IPV) and its association with mental illness in some populations, there is a tenuous grasp of the prevalence of IPV among college students. Moreover, the relationship between anxiety and depression severity within this cohort remains overlooked. A cross-sectional study of students at a university in southern California was conducted to determine the prevalence of IPV, anxiety severity, and depression severity. The survey included the Hurt, Insult, Threaten, and Scream (HITS) screening tool to determine the prevalence of IPV, the Generalized Anxiety Scale 7 (GAS-7) to determine anxiety severity, and the Patient Health Questionnaire 9 (PHQ-9) to determine depression severity. Using a two-tailed t-test and assuming unequal variances, individuals that screened positive for IPV were compared in terms of GAS-7 and PHQ-9 scores. From a total of 396 respondents, 5% were positive for IPV (n=18). IPV-positive individuals were associated with a greater severity of anxiety (10.83±5.711 versus 6.23±5.355; p=0.003) and depression (12.06±6.384 versus 7.34±6.266; p=0.007). Our findings suggest that college students with IPV exhibit a higher severity for both anxiety and depression. Consequently, students that experience IPV may benefit from additional screenings for anxiety and depression. Recognizing this association is necessary for student health services to effectively manage the mental health of their student population.

Metal Toxicity in Artemia Franciscana

Many hypersaline lakes are largely unknown by the public due to their remote locations, which are normally found inland. Due to the lack of regular monitoring, these lakes are subject to a multitude of ecosystem stresses often caused by human activities in the watersheds that feed these sensitive ecosystems. We are working to develop an efficient test for ecosystem stress using the model organism Artemia Franciscana for the use in ecotoxicological bioassays. We are investigating the effects of chromium and other metals on mortality rate and morphology. The results of our experiments showed that chromium had a significant result on both the mortality rate and body length of Artemia. Effects on body length were observed for exposures using concentrations greater than 6 ppm. The lethal concentration for 50% of the population (LC50) was determined to be approximately 5.5 ppm. We will continue to examine the effects of other metals on mortality rate, phototaxis, and metal accumulation to further validate the bioassay method.
Sadness is associated with greater generosity and politeness, suggesting a social benefit to negative emotion (Forgas, 2013). The literature surrounding gender differences in consideration for others is mixed. We examined whether the experience of negative emotion influences compassion for others and whether this differs by 1) the type of negative emotion felt or 2) gender. 225 undergraduates (38% male) were randomly assigned to watch a sad, anger-eliciting, or neutral film. Compassion for others, and the intensity of sadness and anger, were self-reported before and after the clips. Women reported greater trait compassion for others (before films) than men \( t(203) = -2.935, p = .004 \). \textit{Men:} there was a significant effect of film condition, \( F(2,69) = 5.434, p = .006 \). Those who saw the sad film (M = .110, SE = .041) demonstrated a marginal increase in compassion compared to those who saw the angry film (M = -.002, SE = .041) and a significant increase compared to those who saw the educational film (M = -.076, \( p = .039 \)). Those who saw the angry and educational film clips did not significantly differ in their changes in compassion. \textit{Women:} there were no significant effects, all \( F \)'s <2.087, \( p \)'s >.151. Both films depicted situations of social injustice situations, yet only the sad film led to an increase in compassion, and this was specific to men. Discussion will focus on the theoretical and experiential differences between sadness and anger and how these might differentially influence compassion for others.

Daniel Perry, Biology
Faculty Mentor: Dr. Jocelyn G. Millar, Entomology

\textit{Cuticular Hydrocarbons of Elaterid Beetles: Composition and Possible Functions as Contact Pheromones}

Most insects are covered with an epicuticular wax layer composed of mixtures of hydrocarbons and lesser amounts of more polar compounds. This layer prevents desiccation, but subsets of the cuticular hydrocarbons (CHCs) also are used for recognition of sex and species, providing unique signals which ensure that males try and mate only with conspecific females. I hypothesize that subsets of the CHCs of beetles in the family Elateridae serve this function, conveying information vital for maintaining reproductive isolation between species. The Elateridae, or click beetles, include a number of agriculturally important species that damage a wide range of crops. My first goal was to extract and compare the CHCs from representative species of elaterid beetles, and assess correlations between closely and more distantly related species. My second goal was to perform bioassays with live females and treated dummies to determine exactly which compounds play roles in the recognition of species and sex. To date, I have extracted the CHCs from both sexes of eight elaterid species, and using coupled gas chromatography-mass spectrometry, I have identified the majority of the compounds as straight-chain or methyl-branched alkanes, or unsaturated compounds with 1-3 double bonds. The positions of the double bonds in the alkenes are being determined by derivatization. The results from this research will be used as taxonomic characters to help classify each species. It may also be possible to exploit my results to develop new methods of managing pest click beetle species.
Styliani Petraki, Psychology; Marisa Montoya, Psychology; Anondah Saide  
Faculty Mentor: Dr. Rebekah Richert  
Explicit Conceptions of Death as Influenced by Family-Related Background Characteristics

Previous studies reveal that religiosity influences conceptions of death; the more religious, the more likely people are to state that mental functions (e.g., thinking), but not bodily functions (e.g., eating) continue post-mortem (Bering, 2002). Family characteristics during childhood, such as conflict with parents and parental education, influence adult religiosity (McCaffree, 2017). This study sought to explore how conceptions of death, religiosity, and family background are related to each other.

87 students ($M_{age} = 19.33, SD = 2.004, 60.3\%$ female) enrolled in a psychology course completed online questionnaires and in-lab tasks. Undergraduates were ethnically and religiously diverse. Religiosity was an average of participants’ religious behaviors (now: 2 items $\alpha = .845$; during childhood: 2 items, $\alpha = .845$). Conceptions of death were an average of whether or not mental and biological functions continue post-mortem (“mental continuity”: 5 items, $\alpha = .908$, “body continuity”: 5 items, $\alpha = .800$). Parental conflict is an average of how harmonious the parent-offspring relationship is (2 items, $\alpha = .788$). Parental education is an average of highest education parents achieved (2 items, $\alpha = .761$).

Findings showed that religiosity is significantly related to (a) conceptions of death, and (b) family background. The more religious the person is now, the more likely they were to report: greater religiosity during childhood, lower parental conflict, greater parental education, and greater perceptions of mental continuity post-mortem. Additionally, less conflict with parents and greater childhood religiosity were related to greater perceived mental continuity. Overall, this suggests that family-related characteristics impact adult conceptions of death via impacting adult levels of religiosity.

Annie Pham, Linguistics/Computer Science  
Faculty Mentor: Dr. Jon A. Willits, Psychology  
Using Sentiment Analysis to Understand Media Coverage of the 2016 Presidential Election

Can we quantify how different people or topics are talked about (such as politicians like Trump and Clinton) using machine-learning methods applied to real world data, such as cable news transcripts? By creating a program that uses text data taken from social media and cable news transcripts, we are able to measure several factors, such as the frequency of words or individuals, and whether they are used with positive or negative tone. We can also assess differences between sources, such how much or how positively a topic occurs on different news channels (like CNN and FOX News). A lexeme can be discussed with a different tone and perspective, depending on the lexeme’s source. Using these methods, we hope to be able to differentiate sarcastic statements, the number of opinion holders or sources, the tone as a whole with multiple opinions of the same entity, and more.
Nicholas Pham, Chemical Engineering  
Faculty Mentor: Dr. George Becker, Physics and Astronomy  
Analyzing Lyman Alpha Emission in the Intergalactic Medium

Between the billions of galaxies in the observable Universe resides a wide expanse of matter called the intergalactic medium (IGM). Composed of dark matter and gas (primarily hydrogen and helium), the filamentary IGM contains the majority of matter in the Universe. Typically, to characterize the structure, astronomers solely rely on quasar absorption lines. However, while quasar absorption lines are a powerful probe of the IGM, their main limitation is that they provide only a one-dimensional probe of an inherently multi-dimensional structure. To go beyond absorption features, we can use the fact the IGM not only absorbs ultraviolet photons from quasars and galaxies, it re-emits them in the form of a faint Lyman alpha glow. The project aims to determine how best to use this emission to create the first two-dimensional map of the IGM. Through use of simulation data and a Python interpreter, we were successful in constructing analytic models to calculate and measure optical depth, an important parameter to gauge light absorptivity, in both a one and two-dimensional case. These results were later applied to build an IGM emission profile, which was then subsequently transformed into an observable emission profile by introducing absorption effects. In multiple simulations, we have noticed that absorption effects have minimal effect on the emission profile, which suggests a faint emission spectra. Despite this, we were ultimately successful in generating a two-dimensional color plot of the IGM, verifying its web-like structure.

Richard Pham, Psychology  
Faculty Mentor: Dr. Weiwei Zhang, Psychology  
Physical Effort and Cognitive Control

The ability to ignore distractors and focus on the tasks at hand, or cognitive control, is a crucial part of our cognitive functioning. While this ability was initially believed to be a solely mental mechanism, previous research suggests that some cognitive and physical functioning share resources. Yet, it remains unclear how this shared relationship between cognitive and physical functioning affects cognitive control. We will study this connection by regulating the amount of physical strain, and then comparing how the level of physical strain affects the ability to inhibit distractors. Research has shown that we have a limited amount of cognitive resources available at any given time. As the expenditure of these resources increases in other cognitive areas, our ability to inhibit distractors diminishes. We believe that the relationship between cognitive and physical processes share a similar resource bank, and will behave in a similar fashion. We predict that the distractor inhibition ability will decrease as physical load increases. This research may lead to the development of treatments for neuropathologies hindering cognitive control, such as ADHD.
Many insects utilize honeydew and floral nectar as a key food resource, including ants, bees, and wasps. Native to California, *Formica francoeuri* are more commonly known as “wood ants” for they inhabit open woodlands and forests. Diurnal foragers, these ants are also able to secrete formic acid when disturbed or alarmed. We conducted two different bioassays with *Formica francoeuri* using synthetic honeybee alarm pheromone and bumblebee venom sacs to observe their effects on ant behavior. The methods for both bioassays were very similar: we placed one individual *F. francoeuri* ant in a shallow, square petri dish, where one corner was designated the “control” and the opposite the “treatment”. Filter paper was cut and fitted to section off a square centimeter of each side in the petri dish that contained 100 microliters of a 2M sucrose solution. Honeybee alarm pheromone was micropipetted across the treatment filter paper. In the second experiment, I dissected venom sacs from worker bumblebees. The sacs were then ruptured onto the filter paper and served as the treatment for these trials. The results from the first set of experiments showed the honeybee alarm pheromone to be quite the deterrent to the ants. *Formica francoeuri* ants avoided the filter paper containing the honeybee alarm pheromone and fed significantly more often from the control side. Our bumblebee venom sac assays did not yield results as conclusive as the pheromone. The ants would investigate the treatment filter paper much more than the control but would subsequently groom themselves after contacting the venom sacs. These data suggest that *F. francoeuri* detect and respond to chemical cues of bees, which could have important implications for foraging strategies.

The structure of ant societies is highly varied. Comparisons of groups of related species will provide insight into how and how often alternative social forms evolved. We are specifically interested in understanding the evolution of a genetic and phenotypic polymorphism that is exhibited by many species of ants and appears to have evolved repeatedly in different lineages. Well-studied species such as the red imported fire ant (*Solenopsis invicta*) and the alpine silver ant (*Formica selysi*) exhibit this polymorphism, which is characterized by ant colonies consisting either of multiple queens and their offspring (polygynous form) or a single queen and her offspring (monogynous form). Associated with these alternative social forms is a suite of other phenotypic traits and a large, non-recombining region of a single chromosome, known as a supergene. *Formica francoeuri* is previously unstudied; study of this and other North American species will help to elucidate the evolutionary history of the social supergene and the social polymorphism associated with it. Preliminary analysis of 40 *F. francoeuri* colonies indicate that 1) this species is socially polymorphic, 2) this species exhibits the polymorphism in phenotypic traits associated with alternative social forms in other species, yet 3) it does not share the genetic architecture of its European relatives. That is, none of the genetic markers associated with sociality in *F. francoeuri* are found on the same chromosome, in contrast to other well-studied species.
The psychological motivations for cheating has received attention in research, but the intricacies of personality traits as a predictor of thoughts of infidelity are more limited. The current study is from an eHarmony database (N=325) in which married couples completed the Big Five questionnaire and a survey about sexual attraction outside of marriage. Males who were higher in agreeableness and conscientiousness were less likely to endorse thoughts and feelings of extramarital sex. Openness was positively associated with sexual attraction to other individuals, in both males and females. There were no partner associations of personality with partner sexual attraction outside of marriage. The results suggest that personality is more strongly related to sexual attraction outside of marriage for men than for women.

Millions of people throughout the world consume groundwater contaminated by geogenic manganese (Mn) and arsenic (As) (Buschmann et al., 2007). Past research shows that chronic consumption of Mn contaminated groundwater is associated with impaired neurological development and function; however, the biogeochemistry of manganese in aquifers is still poorly understood. A perplexing trend has recently been revealed of Mn contamination consistently occurring in shallower wells compared to the average depth of arsenic contaminated wells. This depth-dependent trend has been found in South, Southeast, and East Asia where redox processes do not fully explain the stratification of As or Mn in groundwater sources. At the same time, bicarbonate is found at high concentrations within highly reduced groundwater sources in many parts of Southeast Asia. Here, we investigate the influence of carbonate on sorption and precipitation reactions that result in the differential transport of As and Mn using soil columns to simulate the aquifer matrix. We hypothesize that soluble Mn will react with carbonate to form rhodochrosite (MnCO₃), an insoluble immobile manganese carbonate mineral commonly found in reduced sediments, while As transport will be enhanced by competitive desorption by carbonate. Understanding the processes that control the mobility of Mn and As will be a step toward better predicting which contaminants are of concern based on measurable biogeochemical parameters.
Clear cell carcinoma is a type of tumor that can be found in the breasts, skin, female reproductive tract and kidneys. Renal carcinoma (RCC) originates in the tubules of the kidney and represents nine out of ten kidney tumors. Seven out of ten RCC tumors are clear cell RCC (ccRCC) tumors. HOTAIRM1 is a tissue-specific long non-coding RNA (IncRNA) that originates from the intergenic region between the HOXA1 and HOXA2 genes. Our preliminary results suggest that HOTAIRM1 expression is deregulated in several types of cancer. Our project is to investigate whether HOTAIRM1 is differentially expressed in kidney cancer and specifically whether HOTAIRM1 expression levels differ between normal kidney tissue and ccRCC tumors. Our hypothesis is that decreased levels of HOTAIRM1 could be a contributing factor in the development of ccRCC and thus HOTAIRM1 could function as a novel tumor-suppressive IncRNA. This hypothesis derives in part from our preliminary bioinformatics analyses of the large RNA-seq datasets of The Cancer Genome Atlas (TCGA) consortium. To test this idea, HOTAIRM1 will be overexpressed in ccRCC cancer cell lines to see if cancer cell proliferation is reduced. Alternatively, endogenous HOTAIRM1 will be depleted by RNAi-mediated knockdown in normal kidney cells to see if proliferation is increased. To gain a better understanding of the functions of HOTAIRM1 at the molecular level, deletion mutants of HOTAIRM1 will be generated and analyzed for their ability to inhibit the proliferation in vitro of ccRCC cancer cell lines. This will map the important sections of HOTAIRM1 that contribute to its anti-proliferative function.

Laura Posada, Psychology
Faculty Mentor: Dr. Rebekah A. Richert, Psychology
A Comforting God is Almighty: How Positive and Negative God Concepts Relate to God Making the Impossible, Possible

Previous research has indicated Protestant and Muslim parents share their religious practices and beliefs with their children early on (Marks, 2004), and children with high religious exposure have been shown to judge God as able to make impossible events occur (Cox Vaden & Woolley 2001). However, how positively or negatively a child views God affects these possibility judgments (Miner et al., 2014), and there might be differences in how these variables relate, depending on religious tradition.

Protestant (n = 35) and Muslim (n = 40) children judged how positively (e.g., comfort) and negatively (e.g., punish) they viewed God, and if God could make six impossible events happen. Parents provided information about the child’s religious exposure.

Results indicated Muslims (M = 66.350, SD = 19.471) had higher religious exposure than Protestants (M = 31.829, SD = 13.678), t(73) = 8.763, p < .001. Muslims (M = .653, SD = .380) also judged God as able to make more impossible events happen than Protestants (M = .402, SD = .400), t(73) = 2.780, p = .007. How many impossible events God could make possible was only positively related to religious exposure, r(73) = .326, p = .004, and positive views of God, r(73) = .274, p = .017, when collapsed across groups.

This supports previous findings on religious exposure and possibility judgments with God (Cox Vaden & Woolley, 2001), and indicates having a positive attachment to God (i.e., positive view of God) relates to judging God as able to change the impossible.
Nonsense mediated mRNA decay (NMD) is the mechanism by which mRNA transcripts with premature stop codons are degraded. DNA damage response (DDR) is the process by which the cell senses, signals, and repairs DNA damage. NMD and DDR are both important cellular mechanisms, however, the relationship between them has never been reported. The purpose of this study is to identify the possible linkage between NMD and DDR. This was done by introducing DNA damage to normal neuro-2A (N2A) cells and NMD deficient N2A cells via etoposide treatments at different concentrations and incubation periods. Various cell protein samples were collected to measure the concentration of γ-H2AX, a widely-used DNA damage marker, using western blots. We found that upon DNA damage, NMD deficient cells express more γ-H2AX than control cells. This shows that when NMD is attenuated, DDR is accelerated. This finding sheds light on the potential role of NMD during DNA damage and repair which can lead to a novel approach toward cancer and neurodegeneration therapies.

Sleep is an optimal state for consolidation processes; however, investigations exploring the role of sleep for emotional processing are conflicting. Here, we investigated the relationship between sleep and emotional memory. We utilized a directed-forgetting paradigm where subjects were presented word pairs (negative vs neutral); were cued to either remember the pairs for a later test ('R') or forget them ('F'); and instructed to rate word pairs on a scale of 1-7 for emotion and arousal (1=negative/not arousing, 7=positive/arousing). Next, participants were placed into one of four nap groups: non-rapid eye movement (NREM) nap, NREM+REM nap, quiet rest (QR) or, active rest (AR). After the nap/rest session, subjects were given a recognition test with pairs from encoding and novel pairs, and asked to rate each pair again. Performance was measured as the number of correct words identified. Subjects remembered ‘R’ pairs better than ‘F’ pairs (p=.043). Additionally, sleep boosted memory for ‘R’ pairs (p=.065) but not ‘F’ pairs (p=.13). No difference was found between negative and neutral pairs for ‘R’ (p=.11) or ‘F’ conditions (p=.26). However, an interaction emerged for ‘R’ pairs with subjects in both nap groups outperforming the wake groups on neutral pairs; all groups performed similarly on negative pairs (p=.047). We found no changes in valence or arousal from encoding to recognition (valence p=.92; arousal p=.12) These data suggest that while sleep benefits information with future significance, it seems to preferentially act on the mundane implying sleep and emotion may be orthogonal, memory-boosting mechanisms.
Zahab Qazi, Neuroscience; Esther Choi, Psychology; Brandon Swan-Prung  
Faculty Mentor: Dr. Sara Mednick, Psychology  
Examining the Possible Effects of Sleep on Working Memory

Sleep is important for cognitive processing, with sleep-deprivation resulting in possible loss of executive functions like working memory (WM). This study explores if a midday nap can boost WM in healthy, young adults. Subjects were randomly assigned to four sleep conditions: active wake (AW) group (i.e. no sleep between Test1 and Test2); quiet wake (QW) group (i.e. an EEG monitored rest period in a dark and quiet room); 50-minute nap group; 90-minute nap group. First, subjects were tested on a WM task (Test1) in which they were instructed to remember a string of either 4 (easy) or 7 (hard) letters in the correct order. Between each letter presentation was an arithmetic distractor task to prevent rehearsal of letters. Subjects then took a nap or stayed awake according to their specified nap conditions and were later tested on the same WM task (Test2). Accuracy was measured as % of letters correct in both difficulty conditions. A one-way ANOVA indicated trending differences between the 4 groups on WM accuracy at Test2 (p=.08), regardless of difficulty type. Post-hoc analyses indicated the QW group performed the worse (<AW p=.02; <50Nap p=.06; <90Nap p=.09). This effect only persisted for the hard condition (p=.052; easy p=.86). Further, post-hoc analyses of the hard condition revealed AW was better than QW (p=.052). These results suggest that executive function is not affected by a nap, but that AW and sleep maybe more beneficial for frontal lobe processing than a period of quiet rest.

Maria Liliana Ramirez, Anthropology and Spanish minor  
Faculty Mentor: Dr. Jennifer Najera, Ethnic Studies  
Embodied Identities: The Experience of Coming Out as UndocuQueer

Queer undocumented students face obstacles stemming from both their legal status and their sexual orientation. They also experience a double coming out; that is, a coming out as undocumented and as queer, which gives them a distinct experience from other undocumented students identifying as straight. The lack of research on queer undocumented students has contributed to reinforcing a homogenous conceptualization of identity formation of undocumented students. What has been written about queer undocumented students has been through the frame of the UndocuQueer movement and therefore has focused on its development, progress, and political entity. Based on findings, this paper looks at the process of coming out as queer and undocumented, and at the rejection of the term “UndocuQueer” as an embodied identity.
Rachel Richardson, Psychology; Jessica Grier, Psychology
Faculty Mentor: Dr. Rebekah Richert, Psychology

The Effect of Sex and Worldview on Empathetic Responding

Research shows that females tend to be more empathetic and religious than males (Vicenta et al., 2009; Kosmin et al., 2009). Research also found religiosity and scientific faith to be negatively correlated (Aghababaei, 2017). This study explored relationships between worldview (religious vs. scientific), sex, and empathy. We hypothesized that higher religiosity levels and lower levels of faith in science among women, but not men, would relate to higher empathetic responding. 247 undergraduate students answered a questionnaire that measured: (a) commitment to religious beliefs and behaviors (4 items, $\alpha = 0.845$), (b) faith in science (10 items, $\alpha = 0.943$) (from Farias et al., 2013), and (c) empathetic responding (60 items, $\alpha = 0.817$) (from Baron-Cohen & Wheelwright, 2004).

Correlations between variables were conducted for each sex. Among men, empathy was not related to worldview. Among women, greater religiosity was related to greater empathetic responding, and greater faith in science was related to lower empathetic responding (see Table 1). Independent Samples t-tests revealed a significant difference of empathy ratings between sexes, $t(234) = -2.995$, $p = .003$, $d = -0.398$. Women had higher ratings of empathic responding. There was a significant sex difference in faith in science scores, $t(245) = 2.200$, $p = .028$, $d = 0.284$; men reported greater faith in science. Religious worldview did not significantly differ between sexes, $t(245) = 0.561$, $p = .575$, $d = 0.073$ (see Table 2). Overall, results suggest that one’s empathy level is related to their worldview, but sex may moderate that relationship.

Mia Rochford, Plant Biology; Peter Ibsen
Faculty Mentor: Dr. Darrel Jenerette, Botany and Plant Sciences

Plant Biodiversity in Southern California Parks

Green infrastructure (GI) is greenery planted to manage and filter storm water, so it may to reduce flooding. GI is a favorable alternative to grey infrastructure, like storm drains, that still requires water treatment. Not only does it prevent flooding, but GI also provides a number of other ecosystem services, like increasing biodiversity; increasing biodiversity improves the overall health of the local ecosystem. Even though parks are primarily built with recreation and beautification in mind, they have enough permeable surfaces to absorb storm water and function as GI. Parks are irrigated and are heavily maintained areas, but park maintenance might not eliminate the effects of climate completely, since climate is an important factor in determining biodiversity. I wanted to find out how much climate impacts biodiversity in urban parks. I predicted that parks further inland would have lower species richness than parks closer to the coast. Hotter environments tend to support less species because water is limited and fewer plants are adapted to high temperatures. I surveyed parks in three cities across a climate gradient in Southern California and recorded the species richness at each site. The species richness trends I observed were fairly close to the predicted trends. Comparing species richness among parks, will give an indication of how much temperature and human interaction influence biodiversity in GI. Studying GI and its benefits will hopefully help its future implementation.
Sense of belonging—a feeling that you belong to a place, have a strong feeling of connectedness with a group, and are important to others—is a basic human necessity. It’s important to assure students’ persistence in schooling and motivation for academic success. A rising number of undocumented students are attending institutions of higher education, but we know little about their sense of belonging in higher education at a time when a social and political climate sends conflicting messages about their place in the United States. This study aims to examine the roles that language, campus environment and coping mechanisms play in the sense of belonging of these students as members of the academic community at large. I will adopt a comprehensive mixed-methods approach to this research, drawing on the disciplinary expertise of our team to incorporate both quantitative and qualitative methodology. For the quantitative, I will use survey (self-report questionnaire) methodology via Qualtrics to assess perceived stress, coping strategies, and sense of belonging of approximately 50 participants. The second part of the study will recruit up to 12 of the survey participants, for an in-person interview subsample study that will focus on further understanding undocumented Latin@ students’ experiences and sense of belonging. This research will develop awareness of the experiences and struggles of undocumented Latino students at the 4-year public university in Southern California, identify practices for helping undocumented students reach their educational goals, and contribute to a better understanding of their sense of belonging in higher education.

Jenna Roper, Bioengineering; Kalish, Brent, Mechanical Engineering
Faculty Mentor: Dr. Tsutsui, Hideaki, Mechanical Engineering
A Method for Depositing Microspheres for Use in Lateral Flow Assays

Lateral flow tests are simple devices used to detect a wide variety of analytes. These devices are portable, stable, low-cost, and user-friendly, making them ideal for point-of care testing. The purpose of this project is to develop a lateral flow device, with a simple and rapid read-out, for quantitative detection of DNA. This device utilizes oligomer-conjugated microspheres that aggregate in solutions containing the targeted DNA. When deposited onto a porous substrate, such as filter paper, the wicking distance of the microspheres is dependent on the size and presence of the aggregates. In lateral flow devices, pre-depositing reagents simplifies user input, making the device more user-friendly. This report details a method of pre-depositing microspheres onto the device so that microspheres dry onto the paper and are able to be rehydrated and wick through the paper. Microspheres are negatively charged, hydrophobic particles. While stable in solution, the drying process forces microspheres close together; when the microspheres touch they irreversibly aggregate. The goal is to block microspheres from aggregating by adding water-soluble inert polymers, proteins, and surfactants to the deposited microsphere solution. The solution must be stable in dry form, yet dissolve easily upon re-hydration to allow the microspheres to wick through paper. We found that depositing microspheres in a buffer containing bovine serum albumin (BSA), sucrose, Tween-20, and PVP-40 allowed the microspheres to wick through paper upon addition of the sample solution.
Copper(II) complexes as a Potential Alternative Antitumor Drug to Cisplatin

Copper(II) complexes possessing alkyl-substituted polypyridyl ligands were synthesized and used as a possibility to an alternative antitumor drug to cisplatin. Copper drugs were seen to be less toxic to the biological system compared to platinum and gold therapeutics. Copper(II) drugs were used to target tumor cells and promote death by the activation of the p53-dependent apoptosis pathway, which damaged the DNA. It was seen that five- and six-coordinate copper(II) complexes that possessed polypyridyl-based ligands were commonly synthesized in literature; however, only few four-coordinate copper(II) complexes were made. Until recently, there were no alkyl-phen or alkyl-bipy copper(II) complexes that possessed polypyridyl-based ligands were commonly synthesized in literature; therefore, mono-polypyridyl copper complexes with chloride ligands and bis-polypyridyl complexes with nitrate and chloride ligands were synthesized. After the testing of these compounds, I was motivated and inspired to synthesize mono-polypyridyl complexes with nitrate ligands instead of using chloride ligands. The mono-polypyridyl ligand and copper(II) with nitrate ligands were dissolved in methanol separately and mono-polypyridyl ligand was added dropwise to the metal complex. Methanol was evaporated at ambient conditions. The product was then recrystallized with hot acetonitrile. Crystals were formed and rinsed with cold diethyl ether. The crystals were dried by rotary evaporation and sent to elemental analysis and X-ray crystallography. 2,2’-bipyridine copper(II) complex with nitrate ligands were formed. For future work, these metal complexes will be tested for SRB analysis.

The Role of Semen in the Evolution of Reproductive Mode

A remarkable feature of fish in the family Poeciliidea is that they have evolved placentas multiple times. Placental species are matrotrophic, meaning most nutrients are transferred from the mother to the offspring during development. Other members of Poeciliidae are lecithotrophic, meaning that mothers fully provision eggs before fertilization. These reproductive modes are correlated with sexual selection. Lecithotrophs often have colorful males that perform courtship displays, while males of matrotrophs lack ornamentation and bright coloration and instead rely on sneak copulation. Our preliminary observation suggests that lecithotrophs, with pre-zygotic mate choice, transmit sperm with abundant, milky seminal fluid. Matrotrophs, with postzygotic mate choice, instead transmit less sperm in clear seminal fluid. Other organisms transmit accessory gland proteins in their seminal fluid which are known to influence the ability of sperm to fertilize eggs. Confirming the presence of proteins in the seminal fluid in some species and not in others provides insight into how the males have evolved in response to differences in female resource allocation pointing to pre-zygotic mate choice evolution. It is important to also characterize the size, shape, and number of sperm contained in spermatophores. My hypotheses are: 1) spermatophores from all species have the same number of sperm, 2) lecithotrophs have proteins in their seminal fluid, which will be revealed by spectrophotometric analysis of the opaqueness of the fluid. The results of this study can suggest intensified pre-zygotic conflict in lecithotrophs and postzygotic conflict in matrotrophs, which will increase our understanding of other organisms with these reproductive modes.
Sarah Ruckman, Biology; Simon Zhu, Biology; Vincent Poon; Biology, Yuridia Reynoso
Faculty Mentor: Dr. David Reznick, Biology

The Genetic Basis for Inheritance of Life History Traits in Trinidadian Guppies

Adaptation occurs through positive mutations that become more common over time either because the organism is more likely to survive and/or produces more surviving offspring. Trinidadian guppies adapted to either high or low predation environments are ideal for modeling the effects of adaptive evolution. Adaptation to life with and without predators has included the evolution of diverse traits, including life history, morphology, and behavior. We have been able to replicate these selective pressures on originally high predation guppies by introducing them into previously guppy-free low predation environments. The originally high predation guppies evolve larger body sizes and are older at reproductive maturity. In our current studies, we are looking at the genetic basis for these adaptations. Our first step is to perform a quantitative trait locus; (QTL) analysis. The QTL takes two populations that differ in phenotype as well as genetically to provide us with markers that will enable us to clarify regions of the genome as being from either population. We mate them, then mate their offspring to create individuals with recombined genomes, then observe the age and size at maturity in the second generation. We compare the individual's phenotype and genotype to determine what genes are influencing the phenotype. Since the parental populations are so phenotypically and genetically distinct we will be able to locate regions of the genome that harbor genes with large effects on the phenotype. The results of this study can further our understanding of heritability of life history traits across multiple species.

Gabriel Ruiz, Statistics
Faculty Mentor: Dr. Subir Ghosh, Statistics

Maximum Likelihood Versus Alternative Regularized Estimators for Logistic Regression Models

The alternative regularized estimators (AREs) are proposed for estimating the parameters of logistic regression models and compared with the maximum likelihood estimators (MLEs). The AREs are dependent on a tuning parameter and the proposed alternative estimators (AEs), which are not regularized. The values of the tuning parameters are obtained to make AREs to be approximately equal to MLEs using a proposed method and the process is explained with a real data as well as a simulated study.
Irini Saad, Neuroscience
Faculty Mentor: Dr. Christopher J. Clark, Biology

Analysis of Wing Sound of Hummingbirds and Bees

Flying insects and birds produce sounds with their wings as they fly. It is common to experience these sounds when we see a bee or a hummingbird flying and hear the buzzing and humming of the wings. As the animal flaps its wings this “wing hum” sound is produced incidentally as a result of the flapping of wings and production of lift. Sound recordings can be used to calculate the force a flying animal has produced during its flight. In my current research, I am examining the sounds produced by insects’ wings and hummingbirds by recording wave sounds in different directions as well as using several microphones pointed at different positions relative to the animal. We can confirm our results by comparing the predicted force to the forces required to lift the animal based on its body weight. I collected study specimens such as honey bees on-campus. I then brought them back to the lab and recorded their sound waves by making them fly directly above where the microphone is pointed. Some of them flew to the desired position and some did not. I then used a program, Raven, to calculate their waveform and spectrogram. Additionally, I researched the wing beat frequencies and the body mass of different flying insects. After collecting the wing beat frequency, the body mass, and the wave sound details, we can then calculate the force and test our model of the relationship between flight forces and sound recording.

Joshua Salazar, Physics; Harris Goldman, Yuanqian Liu
Faculty Mentor: Dr. Harry Tom, Physics and Astronomy

Developing a Frequency Calibration Model for Tellurium Spectra

The Tellurium (Te₃) spectrometer, an optical setup exploiting saturation absorption spectroscopy (SAS) to measure Doppler-free spectra of Te₃ gas, is a preferred frequency reference in the exercise of laser spectroscopy. However, the particle-antiparticle research community has been seeking a resolution to the proton charge radius puzzle of quantum electrodynamic theory (QED). The community has thus been pushing for a positronium frequency 1^{3}\mathrm{S}_{1} - 2^{3}\mathrm{S}_{1} measurement precision greater than the 1 MHz precision limit partly due to the irreproducibility of Te₃ spectra frequencies. This irreproducibility is mostly attributed to temperature (pressure) sensor discrepancies among manufactured Te₃ ovens, Te₃ gas containment/heating units integrated in Te₃ spectrometer setups, and the Te₃ spectra frequency shifts that arise from Te₃ gas temperature (pressure) shifts. A preliminary experiment is currently in progress to make headway towards resolving this Te₃ spectra irreproducibility issue. Using an Ultra Low Expansion (ULE) cavity and a lab-made invar cavity as frequency references, the unique frequency shifts of individual Te₃ spectrum lines will be measured over different temperatures to create the groundwork of a frequency vs temperature model. This prototype frequency vs temperature model would then be used to calibrate different Te₃ spectrometers such that they have identical spectra. Eventually, the completed frequency vs temperature model would be able to calibrate Te₃ spectrometers to a precision higher than precision offered by the Te₂ atlas. Though the measurement precision of this preliminary experiment may not be enough to produce a reliable model, the literature still supports the feasibility of the model’s development.
In *E. coli.*, the coupling of transcription and translation is a central feature that allows for efficient gene expression. In bacteria, this conserved process links two key macromolecules: the RNA polymerase (RNAP) and 70S ribosome. Transcription-translation coupling is essential for preventing RNAP backtracking, maintaining genomic integrity, and conserving energy in the regulation of gene expression. Recent advances have revealed that the mRNA and NusG, an essential transcription factor, are involved in this coupling. However, the involvement of the direct interactions between the RNAP and ribosome has not been studied up to now. Here, we studied the possible direct interactions between RNAP and 70S ribosomes by limited proteolysis. In this method, the presence of 70S ribosomes can cause a change in the degradation pattern of RNAP. Such changes would indicate a direct interaction. I have made substantial progress by establishing the ideal conditions for the limited proteolysis of RNAP. The next step will require us to analyze the changes in the RNAP degradation patterns due to the presence of 70S ribosomes. Any new insight into the direct interactions between RNAP and ribosomes will have widespread implications on our understanding of gene expression in bacteria.

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**Jasmin Sanchez, Neuroscience; Pedro Perez, Biomedical Sciences**  
**Faculty Mentor: Dr. Nicholas DiPatrizio, Biomedical Sciences**  
**Impact of Western Diet-induced Obesity on the Endocannabinoid System in Mouse Pancreas**

In the U.S., there is an increasing epidemic of obesity and obesity-related diseases, such as type-2-diabetes (T2D), due to chronic consumption of a Western diet, which includes high concentrations of fats and carbohydrates. Over two thirds of Americans are overweight with average associated healthcare costs of $200 billion annually. Recent research suggests an important role for the endocannabinoid system (eCS) for feeding behaviors and insulin release from pancreatic β-cells. The eCS is comprised of its cannabinoid receptors (CB1 and CB2), its lipid derived molecules, the endocannabinoids (e.g. 2-AG, anandamide), and its biosynthetic and degradative enzymes. Pancreas from Western diet-induced obese mice were harvested and analyzed. Lipids were extracted and analyzed using LCMS/MS and mRNA expression of key enzymes were quantified using RT-PCR. Expression of the biosynthetic enzyme for 2-AG, DAGLα/β was increased, while expression of its degradative enzyme, MGL, decreased. Interestingly, there was no change in endocannabinoid levels in the pancreas of diet-induced obese mice. This suggests that endocannabinoid levels in the pancreas are resilient to changes in response to prolonged dietary insults. While there were no changes in endocannabinoid levels in whole pancreas, there was an increase in DAGLα expression, an enzyme expressed in pancreatic β-cells in obesity. Thus, microenvironment levels of endocannabinoids in the Islets of Langerhans may be altered after Western diet-induced obesity and need to be researched further. These studies will expand our understanding of the molecular underpinnings of glucose homeostasis, and the role for the eCS in these processes in health and type-2-diabetes.
Lauren Sangster, Biochemistry  
Faculty Mentor: Dr. David Martin, Chemistry  
Synthesis of Neuroprotective Flavalins

Neurodegenerative diseases, such as Alzheimer’s, Parkinson’s, and Huntington’s disease, affect millions of people worldwide. Symptoms include memory loss, cognitive decline, and movement impairment. Current treatments only address the symptoms of these diseases due to a lack of understanding of the causes and mechanisms of these diseases. To address this, attention was turned to natural products because of their intrinsic neuroprotective properties. The flavalins, a family of molecules isolated from a soft coral species, are being targeted by our lab in order to further investigate their neuroprotective, anti-inflammatory, and cytotoxic properties. A key step in our proposed synthesis of the flavalins is to construct the flavalin core using a novel cyclization reaction using visible light because it is an abundant energy source. We will do this through the use of ruthenium and iridium photocatalysts because they absorb light in the visible region and can excite organic molecules to facilitate the desired ring closure. We have created a synthetic scheme to produce the flavalin core but have run into a roadblock. We have evaluated different aspects of these reactions including concentration and photocatalyst to find the best conditions however it seems that the major product is an isomerized form of the molecule and not one that we want. Once we are able to verify that the isomerization is taking place, we will be able to complete all that we can with this project.

Amanda Schaaf, Biology  
Faculty Mentor: Dr. Jefferson Perry, Biochemistry  
Fragment-based Drug Discovery for the Inhibition of SUMO E2 Protein

Posttranslational modification of proteins with small ubiquitin-like modifier (SUMO) tag occurs through an enzymatic cascade involving E1, E2, and E3 enzymes. The SUMO tag promotes proteins to maintain their roles in a variety of cellular processes, such as DNA repair. Notably, this SUMO pathway is dysregulated in a variety of diseases, particularly in cancer, indicating that the SUMO E2 is a potential drug target, most notably for drug-resistant Acute Myeloid Leukemia. Helping the drug discovery search is that there is only one type of SUMO E2 enzyme in humans, called Ubc9. Thus, my research aim is to begin early stage drug discovery against Ubc9, with the overall goal of inhibiting the SUMO pathway/killing cancer cells. Initially, I will crystallize Ubc9 protein that has been purified in the Perry lab. Next, I will perform fragment-based screening, to determine if any small fragment molecules bind to the active site of Ubc9, by using thermal shift assays that can screen potential binding of 100’s of fragment compounds per hour. I will then infuse identified fragments binders into Ubc9 crystals, and determine the x-ray crystal structures of these Ubc9:fragments, with the aid of researchers in the Perry lab. Once we know if and how any fragments can bind to Ubc9, this will enable rational-based drug discovery approaches. Here, initial small fragment hit(s) are developed into lead(s) having high affinity and selectivity for Ubc9, through the use of structural biology methods used in the Perry laboratory, and in collaboration with medicinal chemists at UCR.
Noah Schlenker, Biology
Faculty Mentor: Dr. Derek Roff, Biology
A Study on the Direct and Indirect Relationship between Calling Song and Morphology in the Sand Cricket, Gryllus Firmus

The sand cricket, Gryllus firmus, is dimorphic with respect to flight capability. Some individuals possess a fully functional flight apparatus (hereafter, LW), whereas others have reduced wings, lack flight muscles and are incapable of flight (SW). The LW morph can colonize new habitats but the energy diverted into flight capability (flight muscles, flight fuel) reduces the amount of time it can call, thereby reducing its success at attracting a female relative to the SW. Previous research has shown that female preference results in sexual selection for the call song of the male, SW males are preferred both because they call more and because of some song component(s) that differ from the LW males. This experiment seeks to further the understanding of female preference in Gryllus firmus by asking two questions. 1) Is there a difference between the LW and SW individuals in these key call components? 2) Is there a relationship between the wing morphology and these call components? In the latter case such a relationship would result in female preference not only affecting the call song but also the morphology of males.

Yasmeen H. Sheikh, Psychology; Miguel Miramontes, Linguistics; Andrea Francine Rios, Biology; Bilal Rana, Biochemistry; Evelyn Gámez, Spanish and Linguistics; Paulina Vasquez-Rocha
Faculty Mentor: Dr. Judith F. Kroll, Psychology; Dr. Eve Higby, Psychology
Heritage Speakers’ Language Proficiency and its Relation to Executive Control

Research has indicated increased executive function for bilinguals compared to monolinguals (Bialystok, 2012). It is unclear whether this finding extends to heritage speakers - individuals who acquired a language in early childhood distinct from the dominant language of the society but later became more dominant in their second language (Montrul, 2010). Heritage speakers range in their proficiency in the heritage language. We asked whether heritage speakers retain better executive function than non-heritage speakers and whether the proficiency in the heritage language predicts executive function ability.

We tested 32 young adult heritage speakers of various languages and 15 native English speakers. All participants rated their proficiency in each language on a scale from 1-10 separately for speaking, reading, writing, and comprehension abilities. Heritage speakers ranged from completely non-proficient in the heritage language to fully proficient. To measure executive function, we conducted a non-linguistic task measuring cognitive control (AX-CPT, Morales, 2013) and a novel word retrieval task developed in our lab in which pictures are preceded by distractor words, inducing cognitive control.

We predict that heritage speakers with higher dual-language proficiency will outperform heritage speakers with lower proficiency on both measures of executive function. We are conducting regression analyses to test whether heritage language proficiency predicts performance and an ANOVA to compare the heritage speakers to native English speakers. This is novel research extending previous findings of executive functions in bilinguals to heritage speakers at UC Riverside.
Vikas Shukla, Biochemistry  
Faculty Mentor: Dr. Boniface P. T. Fokwa, Chemistry  
*Evolution of the Magnetic Properties in the Series M2FeB2 (M=V, Nb, Mo, Ta, and W)*

The five Fe-containing borides with the general formula M\textsubscript{2}FeB\textsubscript{2} (with M = V, Nb, Mo, Ta and W) in the Mo\textsubscript{2}FeB\textsubscript{2}-type structure were synthesized for the first time in the 1960’s. The Mo\textsubscript{2}FeB\textsubscript{2}-type structure is a substitutional variant of the U\textsubscript{3}Si\textsubscript{2}-type structure (both P4/mbm, no. 127). In this structure the Fe-atoms occupy the center of tetragonal prisms made from M, which are stacked on top of each other forming columns along the c-direction resulting in isolated chains of Fe-atoms.

In 2013, Wang *et al.* calculated the magnetic properties of Mo\textsubscript{2}FeB\textsubscript{2} and predicted it to order antiferromagnetically. Touzani *et al.* then studied the compounds M\textsubscript{2}TB\textsubscript{2} (M = Nb and Ta, T = Os and Ru) and they showed that these phases are unstable in the Mo\textsubscript{2}FeB\textsubscript{2}-type structure and undergo a structural distortion because of anti-bonding interactions between the Ru/Os-atoms. Similar anti-bonding interactions between the magnetically active Fe-atoms in the series M\textsubscript{2}FeB\textsubscript{2} (M = V, Nb, Mo, Ta and W) are predicted to lead to an electronic distortion and to antiferromagnetic ordering. The magnetic data of the ternary M\textsubscript{3}FeB\textsubscript{2} compounds (with M = V, Nb, Mo, Ta and W) is still not available. We will now present the first magnetic data in this system. Also, a new two-step synthetic approach, using the pseudo-binary Fe-M\textsubscript{2}FeB\textsubscript{2} - system followed by the removal of excess iron instead of the stoichiometric mixture of the elements, led to single phase samples. Moreover, this approach sheds light on the stoichiometry and the solubility limit of Fe in the parent binary phases M\textsubscript{3}B\textsubscript{2}.

Helena Sidrak, Psychology  
Faculty Mentor: Dr. Chandra A. Reynolds, Psychology  
*Elderly Adults’ Quality of Social Interactions*

Recent studies have revealed that grandparents who take care of children can have significant effects on increasing longevity (Hilbrand 2016). Specifically, research has found that grandparents who take care of non-custodial children tend to have a 37% decrease in mortality rate in comparison to grandparents who do not take part in childcare (Hilbrand 2016). The purpose of my study is to measure the quality of elderly people’s social interactions, specifically focusing on whether children present have a positive effect on improving the purposefulness and meaningfulness of life overall. For example, the study will evaluate whether interactions between older adults and children are positively related to the quality of life in terms of mood and health, in comparison to elderly with fewer interactions with children in their lives. The goals and implications of this research are to better understand and possibly contribute to the well-being of elderly communities in terms of improving social environments.
Ashlee Simon, English  
Faculty Mentor: Dr. Susan Zieger, English  
From Wormwood Tinctures to Absinthe Mixers: The Instability of Absinthe in Nineteenth-Century Literature and Culture

“[Absinthe] is one of the strongest alcoholic drinks ever made, with an additional psychotropic potential from the wormwood it contains, but the idea of absinthe developed a mythology all its own” (Baker 7). Absinthe, commonly referred to as “la fée verte” or “the green fairy”, was a popular alcoholic spirit directly tied to much of French and English art and literature during the Decadent movement of the 1890s. Originally prescribed medicinally to French soldiers, it quickly became a recreational “experience” for aesthetes – poets, authors, and artists fascinated with intoxication and its impact on their work. Unlike other spirits, this alcoholic experience was unique, as absinthe provided a ritualistic performance in which the state of the drink was physically altered, consequently mirrored in the states of its consumers. Eventually, this developed from a pastime to a craving, upon which mental degeneration and early death often followed. The history of absinthe as a drug is inherently connected to society and culture of the late nineteenth century. Both pharmaceutical and poisonous, absinthe is an unstable object that attracted cultural attention because the demarcating line between these points is uncertain. For this reason, work about the drink is largely impacted and alternatingly represented by the mystery attached to the artists that drank it and the cultural developments of addiction. In my paper, I will discuss the history and importance of absinthe during the Decadent movement and the literature of the nineteenth century, with an emphasis between medicinal and recreational use, and the instability of its existence somewhere in between. I will be discussing Wormwood, a novel by Marie Corelli, specifically the representation of absinthe and absintheurs, and the choice to diabolize the drink in place of identifying addictive tendencies in the main character, Gaston.

Yanlin Song, Chemical Engineering  
Faculty Mentor: Dr. Ruoxue Yan, Chemical Engineering  
Synthesis of Silver Nanowires with Ultra-sharp Tip for Atomic Force Microscopy

There is an on-going drive for cost-efficient fabrication strategy for atomic force microscopy (AFM) probes for high-fidelity, high-resolution (HR) topographical imaging of three-dimensional nanostructured surfaces. Recently, AFM probes based on sharp-tip AgNWs was demonstrated through a cost-efficient bench-top fabrication technique and with performance parallel to or exceeding that of commercial high-aspect-ratio (HAR) probes. The primary object of this work is to systematically study the controlled growth of ultra-sharp tip AgNWs by amplifying the oxidative dissolution in the polyol synthesis, in which AgNO₃ is used as the Ag precursor, poly (vinyl pyridine) as the complexing agent and ethylene glycol as the solvent and reducing agent. The AgNW samples were characterized by scanning electron microscope (SEM) and it was observed that the addition of (NH₄)₂CO₃ facilitates the growth of ultra-sharp tip AgNWs, based on which, a possible growth mechanism was thus proposed. The enhanced oxidative dissolution of Ag atoms from the twin boundaries on the AgNW tips by complexing the Ag⁺ in solution with NH₃ and CO₃²⁻ resulted in the etching of the original multifaceted AgNW tip to a sharper, rounded tip. The effect of synthesis parameters, such as titration rate, temperature and precursor concentration ratio, on the AgNW tip morphology were studied.
Blockchain For The Public Sector

Blockchain is an up and coming technology that will revolutionize the current digital world we live and operate in. Currently, most people aren’t aware of blockchain, but are aware of the digital currency, Bitcoin. Bitcoin is a decentralized monetary system that relies on public verification to bypass the traditional need for intermediaries such as banks and other financial institutions. This distributed system could significantly disrupt the financial services sector. Blockchain serves as the underlying ledger for Bitcoin to operate. Despite the general publics’ limited awareness of blockchain, major corporations, academics, and governments are paying attention to its development and are attempting to be at the forefront.

As a result of this cutting edge development, this senior thesis will focus on two core components. The first component will be an attempt to grasp the operations and potentials of the blockchain ledger. The purpose of this will be to serve as a foundation for educating the public and public officials on the technology. The second and final core component will be to explore the possible application of blockchain to campaign finances. The hope of this exhaustive feasibility study and proposal will be to serve as a model for the public sector to be the leader of the new technology, instead of behind it. Blockchain’s implications could revolutionize every aspect of our public and private lives and it is the aim of this project to educate those in leadership positions to appropriately embrace its abilities.

Eigenvalue Distributions of Random Matrices

The study of random matrices has many applications in signal-noise detection for large data samples. If a known eigenvalue distribution such as that associated with the Wigner Semicircle Law or Free-Poisson Law is produced when data is entered into a random matrix, it is likely that the data is noise (contains no correlation). Thus, studying additional distributions provides more ways to analyze signal-to-noise ratios. Here we focus on a specific class of random matrices, Wishart matrices, which are rectangular matrices whose entries are Gaussian random variables (they have bell curve distributions). We aim to apply noncommutative polynomials to Wishart matrices and examine the limiting eigenvalue distributions as the sizes of the matrices expand infinitely under an aspect ratio. We hope to find combinations of noncommutative polynomials and aspect ratios that produce distributions which are unions of disjoint intervals without atoms. We will run simulations of these combinations in MATLAB and examine the resulting eigenvalue histograms. We hypothesize that we will need polynomials of degree four or higher in order to produce multiple intervals in the limiting distributions. We also aim to approximate the disconnected distributions using Berstein polynomials. Determining the structures that produce this type of limiting distribution will yield yet another way to test whether large samples of data contain signals or are simply noise.
Structural Studies on the Inhibition of Cancer Promoting Matrix Metalloproteinase-14 by an Antibody

Matrix Metalloproteinase-14 (MMP-14) is a protein with a significant role in cancer progression. MMP-14 enables tumor cells to spread by degrading the surrounding extracellular matrix, a non-cellular physical scaffold that cells adhere to. Previous cancer clinical trials with broad spectrum inhibitory compounds for MMPs have been unsuccessful, as some MMPs, contrary to MMP-14, suppress cancer. The highly conserved catalytic domain of MMPs poses the main challenge for the design of small molecule inhibitors that can distinguish between these MMPs. In collaboration with Dr. Ge’s laboratory, we are trying to overcome this challenge with a targeted evolution approach with antibodies. These antibodies have a long convex paratope that can access the indented active site of MMP-14. FAB 3D9 is one such antibody that demonstrates highly selective and potent inhibition of the catalytic domain of MMP-14 (cdMMP-14) over other MMPs. My goal is to obtain a crystal structure of the cdMMP-14:FAB 3D9 complex. A structure of the complex can provide valuable, atomic resolution details of the mechanism of inhibition. Understanding specific interactions between the active site and the convex paratope can direct the selection of ideal amino acid sequences for antibody development for improved selectivity and inhibitory potency for MMPs. I have successfully purified cdMMP-14 and FAB 3D9, optimized the cdMMP-14:FAB 3D9 complex formation, and initiated screening for crystallization conditions.

Citrus Orchard Conservation Through PCR

This project pursues the complete automation of the polymerase chain reaction (PCR) process for identifying citrus pathogens. Standard PCR machines vary in method, including the use of hot water baths and metal heating components. Although these expensive machines work well in most research environments, they are inefficient for high-throughput situations. For example, this project focuses on the citrus industry. HLB or “citrus greening disease” is caused by a bacterium carried by an insect; it wiped out many orchards in Florida and now poses a threat to California trees. With the automated system I am developing, I can analyze a large quantity of genetic material from insects at the same time, allowing me to target specific locations that have the insect that carries the bacteria. I am using 3D-printed parts for most the system’s components in order to have control on the quality and optimization of the project. Making these components has required the use of SolidWorks for 3D design, Eagle for PC board design, and Visio for creating schematics of the system. I am currently optimizing the system and reducing the amount of material printed, as well as modifying the system as necessary to reduce the number of components required. Once this is complete I will move on to testing the PCR machine on samples of insects. After this testing, I will work with the citrus industry to disseminate the PCR machine and monitor the insect populations in the areas at most risk in order to contain the spread of the disease.
Brandon Tang, Biological Sciences; Fabian Villalobos, Andrew Patalano

Faculty Mentor: Dr. Cengiz Ozkan, Mechanical Engineering; Dr. Mihri Ozkan, Electrical and Computer Engineering

Oleophilic Sponge Material for Novel Sustainability

An innovative design to resolve contamination of oil spills in oceanic waters is imperative in continuing sustainability. Inspired to discover an approach to not only serve this purpose, but also be able to accommodate the preservation of scarce natural resources, we derived an oleophilic graphite material characterized by its ultra-thin, superporous, and superhydrophobic attributes to separate and recover oil from water ecosystems. The microstructure of the material is versatile and can even preserve functionality when pulverized into micro fragments. In addition to these characteristics, the material contains ferromagnetic properties that can be modified by the choice of metals and carbon precursors which makes the material applicable to target contaminants and other oil or toxic matter. The process of manufacturing is designed to be cost-effective and environmentally friendly to produce, using low-cost precursors such as simple sugars and polyvinyl alcohol. Our goal is to have such a cost-effective process be acknowledged and be put into effect widely.

Justin Tang, Bioengineering; Akash Govan, Bioengineering; Kevin D. Portacio, Bioengineering

Faculty Mentor: Dr. Jiayu Liao, Bioengineering

Quantitative PD-L1/PD-1 Protein-protein Analysis for Cancer and T cell Interactions

Cancer is a disease that occurs when cells divide uncontrollably; and if left untreated, these cells can continue to grow and eventually disrupt organ functions. T cells destroy cancer cells via cell-mediated immunity. In cell-mediated immunity, immune cells bind to abnormal or virus-infected cells via ligand-receptor interactions and induce apoptosis. However, some cancer cells can evade T cell recognition by having a protein known as programmed death-ligand 1 (PD-L1). If they connect to a T cell surface receptor protein called Programmed cell death protein 1 (PD-1) and create a PD-L1/PD-1 protein-protein interaction, they can inhibit a T cell’s response and continue to live. Förster resonance energy transfer (FRET) is a technique that analyzes protein-protein interactions using fluorescent proteins tags. Proteins can have fluorescent tags attached to them through genetic modification. A FRET machine emits various wavelengths of light onto a tag. The energy from the light is transferred from one tag to the next and the light emitted can used to measure protein-protein interactions. Dr. Jiayu Liao’s research in FRET has been proven capable of obtaining close measurements to other approaches and targets protein-protein interactions in vivo. Using FRET technology from Dr. Liao’s lab, I hypothesize that we can use FRET to quantitatively measure the activity of PD-L1/PD-1 interactions. The goal is to genetically modify proteins and use FRET to measure PD-L1/ PD-1 activity. If this method is successful, it will expand our knowledge on cancer and can further lead to in vivo studies.
Amanda Tedesco, Neuroscience
Faculty Mentor: Dr. Manuela Martins-Green, Cell Biology and Neuroscience

**Identifying Biofilm-Disrupting Properties of N-acetyl-L-cysteine**

Elderly and diabetic patients have increased risk of developing chronic wounds because they have biofilm-producing bacteria in the wound. Biofilm is a major hinderance in physicians’ efforts to treat these wounds because it protects the bacteria within from external physiochemical aggressions, host immune responses, and antibiotic treatments. We generated chronic wounds in diabetic mice by inhibiting two major enzymes that decrease oxidative stress and found that the excess oxidative stress can be reversed through treatment with N-acetyl-L-cysteine (NAC), a commonly used chemical to loosen mucus in cystic fibrosis patients. We hypothesized that NAC disrupts biofilm by interacting with biofilm proteins and tested this possibility by treating biofilm from diabetic mouse chronic wounds *in vitro*. To test whether the thiol group in NAC is critical to disrupt biofilm, we compared the ability of NAC to other thiol-containing chemicals, dithiothreitol and β-mercaptoethanol, and found that only NAC produced a smaller molecular weight protein band pattern, suggesting that the thiol group is not important. To determine whether the carboxyl group is key for NAC biofilm disruption, we used N-acetylcysteine amide (AD4), a NAC derivative with an amide group replacing the acidic carboxyl of NAC. We found that AD4 produced similar band patterns to the control; hence, the NAC carboxyl group appears to be critical for biofilm dismantling. We tested NAC at neutral pH and found that it produced similar protein bands to control. These results highlight the importance of pH-balance and that the carboxyl group of NAC may be critical for biofilm disruption.

Ashley Claudio Torres, Psychology; Youstina Mary Beshay, Psychology
Faculty Mentor: Dr. Rebekah Richert, Psychology

**Children Don’t Cite Their Sources: Source Monitoring in Concepts of God**

Children readily believe in entities that cannot be seen (e.g., Santa Claus). However, how much they endorse the existence of an entity varies by patterns of testimony they receive (Harris & Koenig, 2006). For instance, children as young as 3-years-old use verbal testimony to inform their own judgments of an entity’s existence after hearing a conversation where an entity was explicitly denied, explicitly affirmed, or implicitly endorsed (Woolley et al., 2011). That said, it is not always the case that children remember the source of knowledge for how they learn something, as one study found that only 25% of 4- to 5-year-olds and 45% of 7- to 9-year-olds were able to correctly cite how they learned science, math, and history material (Bemis et al., 2011). These proportions might be higher for entities that require testimony (e.g., God).

Children (N = 118) from a variety of religious affiliations were asked how they knew if God possessed nine humanlike characteristics and if God was real or pretend. Responses were coded for citing sources of knowledge: person (family, self, other), religion (God, religious text), other, no source.

Results indicated children listed any source of knowledge only 12.84% of the time, with person the highest (10.04%), followed by religion (1.44%), and other (1.36%). Because self was the most frequent, Theory of Mind might moderate children’s ability to generate the source of information. These findings are important for researchers investigating the role of testimony in children’s concept development.
Tropical Relict Plant Species in the California Floristic Province

The California Floristic Province is comprised of species originating from tropical floras to the south, desert floras to the east, and coniferous forests to the north. However, with the development of a Mediterranean-type climate with cool wet winters and hot dry summers approximately three million years ago, many species have gone locally extinct due to lack of resistance to the change in environmental conditions. Species that remain represent groups selected from a larger pool of species adapted to the summer rainfall climate present before the Pliocene throughout western North America. In our investigation, we studied the biogeography of tropical relicts of two plant families, the Fabaceae and the Anacardiaceae, to test whether their range is limited to certain regions of Northern and Southern California that possess elements of climate that parallel their evolutionary tropical origin. There are approximately fifteen genera of woody tropical relicts in Fabaceae, and two genera and two species of woody tropical relicts in Anacardiaceae, as seen in both our field work and in the literature. As environmental conditions continue to change in this habitat, whether due to prolonged drought or human activity, it is important to recognize how the California Floristic Province has developed through evolutionary time in order to make accurate predictions of climate change outcomes. Doing so will enable researchers to better preserve plant species with and without tropical origin in the current mixed plant community, preventing large-scale species loss within the California Floristic Province.

Cytotoxicity of Electronic Cigarette Solvents: Propylene Glycol and Glycerol

The increased popularity of electronic cigarettes (ECs) has increased health concerns regarding their use. This study examines the cytotoxicity of the common EC refill fluid solvents, propylene glycol and glycerol. Aerosols of varying ratios of propylene glycol and glycerol were made using an EC (tank boxmod model) at 3 volts and 5 volts and then collected in the cell culture medium used for human pulmonary fibroblasts (hPF) and adenocarcinoma human alveolar basal epithelial cells (A549) using a smoking machine. hPF and A549 cells were then exposed to each collected aerosol and incubated for 48 hours. A cytotoxicity test (MTT assay) was used to analyze cell death and to determine whether an increase in voltage/wattage increased the cytotoxicity of aerosolized solvents. Both cell types were more sensitive to 5 volt aerosols than 3 volt aerosols. The data indicate that higher ratios of glycerol result in higher cytotoxicity. This is particularly concerning when considering refill fluids that solely use vegetable glycerol as a solvent, such as certain flavors made by Red Oak. In addition, when identical solutions were used in different tanks, cytotoxicity varied. hPF showed higher sensitivity than A549. These data indicate that variations in EC voltages, solvent ratio mixtures, and tank choice can alter produce aerosols that are cytotoxic to human lung cells.
Impact of Soybean Oil High Fat Diet of Hypothalamic Feeding Circuits

It is well established that the intake of fatty foods induces obesity, although relatively little attention is given to the type of fat. It has been recently found that reduced immunoreactivity of oxytocin in PVN of obese mice fed a high fat diet (40% fat) made up of coconut oil (HFD) containing added soybean oil that has high LA (LA-HFD) when compared to control mice (HFD). Oxytocin in the hypothalamus may control food intake and fat and glucose metabolism. The purpose of this project will be to use qPCR to measure if liporegulatory genes of interest (GOIs) are altered by LA-HFD and to test if effects are due to LA or other components. Expression of GOIs for leptin (Obr, Stat) and for Oxt will be measured. The primers for Oxt have been optimized and the efficiency curve taken, and there has been qPCR data taken on this primer. The Stat primer has been optimized, but efficiencies still need to be taken before qPCR experiments can proceed. The Obr primer still needs to be designed, optimized using efficiency data and processed via qPCR for transcript levels. Using my previous experience I will design gene-specific primers using BLAST software and test them for specificity. Amplicons are run on an RNA gel to verify a single product between primer and template. Optimized primers are then used to generate efficiency curves using qPCR. RNA will be isolated from fat or brain micropunched samples (PVN, ARC) using an RNA isolation kit. Using qPCR I will measure transcript levels of GOI normalized to beta-actin.

Parents’ Provision of Emotion Regulation Strategies and Children’s Anxiety Predict Physiological Recovery from Disappointment

Flexible emotion regulation (ER), an adaptive process when individuals apply different strategies to alleviate negative emotions, can have many implications in psychopathology (e.g., anxiety). Respiratory Sinus Arrhythmia (RSA) is a physiological index of ER ability, with RSA recovery known as the physiological recovery to a stressor. RSA recovery can be adaptive because it conserves resources when no longer needed. Children can learn ER abilities from watching parents coach strategies. Our goal was to examine parental inflexibility in provision of ER strategies for children with anxiety symptoms and its impact on their physiological adjustment. One hundred eighty-four 3 to 11 year olds, participating with one parent, were given an undesirable toy. RSA recovery scores were calculated, where positive scores indicate better recovery. Parents’ responses were coded for strategies they suggested for their children (e.g., expressive encouragement). We created a variable measuring inflexibility in provision of strategies when parents persistently coached the same strategy. Parents reported on children’s anxiety using the SCARED from which the Panic Anxiety subscale was of interest due to the uncertain nature of the task outcome. Analyses revealed that children with fewer panic anxiety symptoms physiologically recovered better when parents inflexibly coached expressive encouragement (EE) and less when parents inflexibly coached behavioral distraction (BD). Children with higher panic anxiety symptoms physiologically recovered less when parents inflexibly coached EE, but better when parents inflexibly coached BD. Results suggest that parental inflexibility in provision of strategies relates to distinctive physiological recovery patterns for anxious children.
Validating the Semantic Priming Program in the SCiL iOS Application

The Semantic Cognition in Language (SCiL) project is a collaboration between the Computational Cognition Lab (CCL) at UCR, Apple’s ResearchKit program, and an Apple-sponsored developer team at the Centro Universitário Senac - São Paulo and the National Service for Commercial Education (SENAC) in Brazil. The goal of this project is to develop an application for iOS devices that can be used to conduct cognitive experiments investigating neurologically impaired memory and language function. As a precursor to the launch of this application a set of questionnaires and tasks were developed to be used as a pre-screening mechanism for users and to collect data about the participants, including psychiatric history, literacy, reading activity and physical activity questionnaires, as well as a well-being assessment (Lyubomirsky & Lepper, 1999). Online databases such as Google Scholar and PsycINFO were used to find relevant research to verify the validity and reliability of the questions being asked and how these topics could be useful for the future of dementia research. The next phase of this research is to determine the reliability and validity of the SCiL application. Pilot studies aim to replicate the Lund et al (1995) semantic priming experiments with three types of word relationships and extend this research by evaluating the role of vocabulary level in the priming effect. In addition, we are developing a vocabulary test that will be calibrated with the Hyperspace Analog to Language (HAL- Lund & Burgess, 1995) model of semantics. Ultimately, the application will be available for other researchers to utilize independently.

Potential Brain Gene Markers for Neurobehavioral Deficits Produced by Developmental Exposure to Indoor Flame Retardants

Autism spectrum disorder (ASD) is characterized by social and behavioral social deficits during development through three main areas: Social-interaction, communication, repetitive behaviors as well as limited interests or activities. As there are a rise in cases, a sole genetic basis is unlikely and scientists suspect that there could be environmental sources. Polybrominated diphenyl ethers (PBDEs) are organohalogens used as flame-retardants and found indoors (furniture foam, electronics, and baby products). PBDEs are passed on through contaminated breast milk and via indoor dust liberated where children have a higher risk of ingestion/inhalation. Preliminary lab data indicated a decrease in PACAP concentrations in several brain areas in mice when exposed to PBDEs suggesting that PBDEs may be affecting social recognition by targeting PACAP and/or PACAP receptors (PACAPR1). In addition, previous research has shown a deficiency in Heperan Sulfate in social brain areas, specifically the amygdala, lateral septum, and cingulate cortex, can lead to impairments in social interactions. I hypothesize that PBDEs target PACAP, PACAPR1 and EXT1 (a precursor for Heperan Sulfate) in the developmental stage and may be the cause of ASD like behavior in mice. We expect an increase in PACAP and PACAPR1 and a decrease in EXT1 expression in these social brain regions. If so, the findings would suggest that PBDEs play a role in ASD by targeting EXT1 and/or PACAP and PACAPR1 in mice further showing the disruptive developmental effects of PBDEs.
Leadership behaviors can be broadly categorized as having the ability to inspire others to work toward a common goal. Previous literature suggests that leadership is not unidimensional; rather, it may manifest as several distinct patterns of behavior that are differentially expressed depending upon the behavioral demands of one’s situation. The current study classifies leadership behaviors as three distinct styles – domineering, task-oriented, and social-emotional – and examines the degree to which behaviors representative of each style are expressed across different situations. Participants engaged in three social interactions – an informal chat, a cooperative task, and a competitive task – in unacquainted triads. Trained observers watched the video-recorded interactions and assessed participants’ behavior. Results indicated that each leadership style was expressed differently based on the behavioral demands of the situation. For example, task-oriented leadership was most commonly expressed during visits involving the pursuit of a goal.

Goal setting has positive implications on our lives, such as promoting motivation to complete tasks and influencing individuals to work harder on future tasks (Locke, Cartledge, & Knerr, 1970). The purpose of this study is to explore how ethnicity, gender, age, and the number of hours students work per week relate to the kinds of goals students set for themselves. 1331 Participants (N=1331; age 17-46; 64.2% female) were asked to answer questions about their demographic characteristics and list current life goals. These goals were coded using a taxonomy based on goal content (Reisz, Boudreaux, & Ozer, 2013). Results reveal that older college students set fewer financial goals. Goal content varied by gender; for example, females were more likely to set goals pertaining to maintaining or improving relationships with family members than were males. Students who worked longer hours set more goals to relax. Ethnicity differences were also identified. For example, Asian-American students were more likely to set goals to make new friends than were Latino students; while Latinos were more likely to set goals to improve or maintain romantic relationships than were Asian-Americans. Overall, these results provide initial insights into how students’ goals differ between groups.
Natalie Wong, Entomology
Faculty Mentor: Dr. Bradley Mullens, Entomology
Egg Distribution of the Bluetongue Virus Vector, Culicoides sonorensis, and its Relevance for Vector Control

Culicoides sonorensis is a small, blood-sucking midge (fly). It is relevant to the agricultural industry because it is the most important vector of bluetongue (BT) virus in the United States. BT causes devastating economic impacts and detriment to sheep and cattle (livestock) health, such as lameness, deformity, abortion, and death. Not only is BT an issue in the U.S., but also it is found globally. As a result, international trade barriers are implemented and livestock productivity is lost. Immature life stages of C. sonorensis are found in and around wastewater ponds and are an understudied control target. Samples surveying the egg density relative to waterline will be collected in the field and analyzed to better understand C. sonorensis life history. With a better understanding of C. sonorensis, we can develop control methods and reduce disease transmission in the future.

Travis Wrightsman, Biochemistry; Cameron Hatch, Dr. Jason Stajich, Microbiology and Plant Pathology; Dr. Jinfeng Chen, Microbiology and Plant Pathology
Faculty Mentor: Dr. Susan Wessler, Botany and Plant Sciences
Exploration of Transposable Element Families in the Citrus Genome Fairchild

Citrus alone accounts for over $2 billion of California’s annual agricultural production value; its economic importance drives the large amount of citrus research performed at the University of California, Riverside. Transposable elements (TEs) make up a large component of eukaryotic genomes and therefore may have significantly contributed to citrus diversity. Specifically, miniature inverted repeat elements (MITEs), the most common TE in plant genes, and active transposable elements may be responsible for recent impacts on citrus diversity, but no substantial effort has been made to annotate a complete set of either in citrus. A multi-lab collaboration funded the PacBio sequencing of a UCR citrus mandarin variety named Fairchild. This long read-based assembly is expected to have more accurately assembled repetitive regions of the genome, which are commonly transposon-dense but often misassembled or collapsed in short read-based assemblies. The focus of this project is to annotate the entire collection of TEs in Fairchild to form a basis for continued research on citrus diversity. The Tree Analysis of Related Genes and Transposons (TARGeT) software package is used to identify Fairchild homologs of transposases, the proteins responsible for TE mobility. The phylogenetic tree provided by TARGeT allows for selection of putative homologs in citrus, identified by the shortest branches between two or more element nodes, which potentially indicate very recent TE duplication events. To date, several putative elements of the hAT and PIF/Harbinger superfamilies in Fairchild have been selected as candidates for in vivo tests of activity in Saccharomyces cerevisiae.
Behavior consists of two factors: the person and the situation (Funder, 2016). Recent well-being research has focused much more on the former rather than the latter, with numerous studies showing that certain personality traits (i.e., extraversion) are associated with individual levels of happiness (Fernham & Cheng, 1997). However, these studies are typically limited to the personality domain, and within a single culture. Thus, less studies have been done to display the relationship between the situational domain (e.g., Gross Domestic Product (GDP)) and its association with national averages of happiness cross-culturally (Hagerty & Vehoveen, 2003). To further investigate the associations between countries’ relevant situational factors with their national averages of happiness, this study expands upon previous studies by examining the possible relationships between the world development indicators and national averages of happiness across 158 countries. This study correlated the national averages of happiness – derived from the Gallup’s 2016 World Happiness Report, and other aspects of World Development Indicators (e.g., Gross National Income, Adult Literacy rate, etc.) – derived from the 2016 World Data Bank. Results show that happier countries on average, tend to have higher Internet Access Rate ($r = 0.792$), higher Adult Literacy Rate ($r = 0.550$), and higher Gross National Income rate ($r = 0.680$). Furthermore, results replicated previous research by showing that happier countries tend to have higher GDP ($r = 0.679$); however, there are no significant relationship between happiness and the GDP growth rate. These results stress the complexity of both situational attributes and happiness when examined cross-culturally.

Siberia, possibly derived from the Siberian Tartar word *sib ir* meaning sleeping land, evokes for me a land that has unwoken potential. In this paper, I explore what seems at first an unrelated area of study, the spaces of modernity and supermodernity created in works of literature set in Soviet Siberia. I studied the works of Shukshin, Sartakov, and Ginzburg in conjunction with the theoretical works of Martin Heidegger, David Spurr, Michel Foucault, and Marc Augé. I start by creating a distinction among the Soviet authors, first by what I call good and bad Soviet citizenship, and then by the author’s relationship to Siberia (urban and exurban). Using these distinctions, it becomes easier to discuss the importance and differences of dwelling in each created by the author in their works, and by using dwelling as a central concept, this allows discussion of the spaces of dwelling, or lack of, such as in Foucault’s *heterotopias*, and Augé’s *non-places*. At first glance, the two big concepts of Soviet Siberia and European modernity that are brought together seem mismatched. However, throughout the paper I sought to understand the works of these Soviet authors in a different light, to bring fourth an understanding Soviet literature that is highly intertextual and hopefully will better the understanding of this area of the Arctic in history.
Seanna Yang, Biochemistry  
Faculty Mentor: Dr. Jon A. Willits, Psychology  
A Lexical Road Map for Children’s Understanding of Question Words

In attempting to understand the process that children undergo in their language development to reach a point in which they understand requests or questions, we are taking a “road map” approach. We are investigating when children learn the components of an interrogative sentence, focusing on when they learn words that are frequently used with question words (such as what, when, etc.). Essentially, does the interconnectedness of certain words with question words play a significant role in whether children understand some requests before other requests? To answer this, we are conducting a correlational study investigating what percent of children use the interrogative word as a function of how often words they know show up in a sentence with that interrogative word. We hypothesize that the strength of this relationship will predict how quickly interrogative sentences are learned, and that a low percentage of children using a certain interrogative word can be explained by the fact that it is not used often with words they use and understand. For example, 46% of children use what, whereas only 23% of children use why and 2% use which. It is possible that because more concrete and well-known words are used with what, this will predict its higher usage than other interrogative words. In contrast, why and which are used more frequently with abstract words. Findings from this study can provide implications for ways to enhance the interrogative aspect of language development in children.

James J. Yen, Bioengineering; Carlos Aguilar, Biochemistry  
Faculty Mentors: Dr. Martha L. Orozco-Cárdenas, Botany and Plant Sciences; Dr. Eugene A. Nothnagel, Botany and Plant Sciences  
Expression of Plant Cell Wall Methyltransferases in Bacteria

As petroleum deposits are being depleted and combusted to release climate-changing CO₂, biofuels produced from plant cell walls become more attractive since they are close to carbon neutral and can be sustainably produced at high level. Thus, research on plant cell walls is becoming increasingly important. This project focuses on methyltransferases that add O-methyl ethers to sugars in cell walls. The moss Physcomitrella patens produces arabinogalactan proteins containing up to 15 mol% 3-O-methylrhamnosyl residues. Two moss genes encoding methyltransferases MT1 and MT6 have been discovered, but when transgenically expressed in tobacco, these genes cause synthesis of 3-O-methylgalactosyl residues instead of 3-O-methylrhamnosyl residues. The hypothesis is that the methyltransferases can methylate either rhamnosyl or galactosyl residues, depending on substrate conditions. The approach is to separately express the methyltransferases in E. coli, purify the tagged proteins, and biochemically assay their enzymatic activities under controlled conditions. The approach is to separately express the methyltransferases in E. coli, purify the tagged proteins, and biochemically assay their enzymatic activities under controlled conditions. Physcomitrella cDNAs corresponding to MT1 and MT6 were modified to remove the transmembrane domain and to add a short N-terminal peptide that binds to a modified streptavidin to enable affinity purification. This modified cDNA was then cloned into the pASK-IBA16 plasmid under the control of the tetA promoter so that expression can be induced by anhydrotetacycline. The plasmid also adds an aminoacyl sequence that targets the polypeptide to the periplasmic space, facilitating selective extraction and purification. Analysis of bacterial proteins by polyacrylamide gel electrophoresis after application of anhydrotetacycline shows induction of proteins at the expected size of approximately 34 kDa. Supported by USDA NIFA grant 2008-35318-04599.
The fundamental right to have access to clean drinking water should not be a problem for developed nations. However, the increased usage of fertilizers to sustain a growing population has been the main source of nitrate contamination in drinking water sources. Lower-income and rural communities have been plagued with high levels of nitrate in their drinking water from private wells. The human health cost of consuming highly nitrated water has been linked to methemoglobinemia, stomach and esophageal cancers and adverse reproductive outcome. Thus, the objective of this project is to showcase a novel technology that could cost-effectively remove high amounts of nitrate from drinking water sources. An electro-mediated packed bed granular activated carbon system was designed to remove high concentrations of nitrate. The prototype was observed to have a removal efficiency of 99% within the 8 hours of treatment time, with a 20 mg/L nitrate loading. Additionally, the system was observed to continuously remove 20% after the allotted treatment period. Nitrogen derivatives – nitrite, ammonium, and NO\textsubscript{x} gases – were not observed as by-products of the treatment. Thus, by-product generation could be attributed to the conversion of nitrate to nitrogen gas. Therefore, the system addresses the number of concerns of dwindling potable water, and increasing water treatment cost with minimal waste generation. The novel technology, if optimized, could treat groundwater previously considered too contaminated. Thus, this technology has the potential to generate safer drinking water for communities impacted with high levels of nitrate contamination in their drinking water resources.

Kenneth Zalke, Business Economics; Audrey Steinberg, Business Economics
Faculty Mentor: Dr. Carolyn Sloane, Economics

The House Office Lottery

Both the media and the academy’s coverage of the increasing polarization in Congress and its damaging effects to the legislative process have focused public attention on the issue. In order to understand the changing distribution of ideology, it is helpful to understand what influences an individual’s own ideology. As such, this project focuses on the influence of interaction between political actors—namely Members of the House of Representatives. Interaction naturally involves selection: people often gravitate towards others who share similar attributes. In order to break this selection and identify the effect of plausibly exogenous interaction between elected officials on their resulting political activity, we need a source of randomization. One such source is the House Office Lottery: a biennial process in which freshmen Members of the House of Representatives are randomly assigned offices in one of the three House Office Buildings – the Cannon, Longworth, and Rayburn buildings. This random assignment of offices may create an environment within the House Office Buildings that allows Members on different points of the political ideological spectrum to interact who may not have done so otherwise. Studying these interactions is important as an established literature in sociology and economics has documented the salience of networks to the flow of information and impact on resulting outcomes. Using over 100 years of congressional data, we are testing the effect of plausibly random interaction between dissimilar Members on resulting political behavior by examining outcomes such as voting behavior, co-sponsorship activity, staff mobility, and fundraising activity.
Mehruba Zaman, Biology  
Faculty Mentor: Dr. Bahram Mobasher, Physics & Astronomy  
*Heart of Creations: Space Fiction Novel Based on Some True Astronomical Concepts*

We live in the era of astronomy where space and space exploration are peaking - from the planned 1-way trips to Mars, the recent discovery of the Trappist-1 star system, to the possibility of life on Jupiter’s ice-moon Europa. However, despite the meteoric rise of astronomical breakthroughs, a concerning dearth of interest in space pervades today’s social-media obsessed tween-and-teen masses. Furthermore, there is a scarcity of young-adult space fiction novels too. So to address both issues, I’m undertaking an outreach creative project of writing a young-adult, coming-of-age novel of around 40,000 words to breed interest in science through fiction among the audience – primarily the young-adult audience. My novel will be an action-adventure space fiction narrated from the perspective of 15-year old Violet, whose entire world turns upside down after she finds out she is actually a Zephyx – an alien species with supernatural gifts - and is transported to X-ava-X, one of the galaxy’s most elite schools for such aliens. The novel is more high-fantasy than hard science-fiction, with the setting and plot being grounded in a completely fictional planet in our own galaxy that’s invisible from earth. Although, steeped in fiction, much of this creative project actually draws from actual astronomy concepts, such as the notion of dark matter, the possibility of life on ice-moon Europa, asteroid comet belts, the new planet Violet transfers to having several moons – a concept inspired from Jupiter’s several moons, and a crucial scene in the novel involving satellite images from the Hubble Space Telescope.

Eduardo Zamora, Chemistry  
Faculty Mentor: Dr. Thomas Morton, Chemistry  
*Synthesis and Characterization of C$_{12}$H$_{22}$N$_{12}$O$_{2}$ using Spectroscopy and Energy Calculations of a Triazole-containing Fragment*

We have synthesized a sample of C$_{12}$H$_{22}$N$_{12}$O$_{2}$ in our lab by heating 2,2'-(Ethylenedioxy)bis(ethylamine) with dicyandiamide (C$_{2}$H$_{4}$N$_{4}$). This chemical is of interest to our group as a precursor to a binding agent to a secondary structure of DNA called the *i*-motif. To confirm the synthesis, we extracted the product of heating with boiling tetrahydrofuran (THF), and obtained a mass spectrum of this sample. An (M+H)$^+$ peak of m/z 367 matched our predicted molecular formula, C$_{12}$H$_{22}$N$_{12}$O$_{2}$. Our work now concentrates on determining the structure of this compound. A preliminary guess of this molecule’s structure is shown here, but the tautomeric equilibrium is unclear. In order to learn more about the tautomeric equilibrium, we have performed calculations on various tautomers of a fragment of our compound containing a triazole and guanide group. We are studying the relative energies of said tautomers to predict the structure of the triazole group in our larger compound. DFT calculations of three tautomers were performed at the b3lyp/6-31G** level. The calculated electronic energies of tautomers 1, 2, and 3 were -485.757560, -485.760956, and -485.721967 a.u., respectively. Tautomer 2 has the lowest energy out of these three, indicating greater stability than a fragment of our predicted structure containing tautomer 1. We are working on increasing the number and intensity of these calculations by modifying the DFT calculation level, and increasing the number of tautomers studied.
Cesar Zarate Cano, History
Faculty Mentor: Dr. James P. Brennan, History
Mexico Under Rightist Ideals: Sinarquismo and the Question of Transnationalism

The far right-wing political movement, named Union Nacional Sinarquista (National Synarchist Union), that emerged in Mexico during 1937 is an example of foreign influences in a country during a tumultuous epoch. The emergence of fascism and Nazism in Italy, and Germany respectively, gave birth to new forms of authoritarian ideology. The growth of such ideologies would begin to antagonize political relations between nations, not just in Europe, but across the Americas. The importance of this study is to demonstrate the impact of the Sinarquista movement and its flirtation with fascism in Mexico. In fact, this study explains the standing of the Catholic church and the power of belief amongst nationalist conservatives in Mexico. In addition, this analysis expands on the continuous relationship between Spain and Mexico and the effects it had on the creation, goals, and desires of the Sinarquista movement. Past studies on the topic have disregarded or not considered the heavy influence Francisco Franco and his Traditional forces had on the Sinarquistas in Mexico; which is a key aspect discussed in this investigation. The results of this research demonstrate the relevant importance of family ties, along with a proud Spanish heritage, in linking both the Falangistas in Spain and the Sinarquistas in Mexico.

Ivy Zeledon, Bioengineering
Faculty Mentor: Dr. Deborah Wong, Music
Song Covers: Social Response to Current Policy

The literature on song covers has conceptualized them (e.g., by Solis) as a genre-specific individualized process. According to Magnus and Uidhir, this takes many forms including the transformation of the song; Plasketes would claim that a song cover is a recycling of knowledge. In my opinion, this endows the new version with a feeling of rebirth that echoes Meyer’s view of Tribute bands as a form of historical consciousness. Song covers activate complex issues and yet it does not intimidate journalists, who regularly comment on the controversy of certain song covers such as “Blurred Lines,” in light of copyright laws and legal struggles over song ownership. The significance of the song cover can be found in this controversy and the way a democratic society’s political opinions can steer the course of law and act counter to that law. This project’s purpose is to examine the opinions of a sample of UCR’s population on song covers and to find potentially predictive correlations between demographic information and views on song covers and associated legalities. To this end, a survey has been distributed online—asking questions such as “Do you believe that making a song cover without profit should require licensure?” This quantitative approach has been deepened with qualitative interviews with willing participants (who have filled out the survey prior to the interview). The research elements are being incorporated into a capstone paper guided by Professor Wong.
Stem cell therapy has been widely studied in the past and current stem cell research often relies on growth factors to stimulate cell differentiation. However, these growth factors are not only short-lived proteins but also expensive resources. Reports have showed that electromagnetic fields (EMF) also have the ability to induce cell differentiation. In light of this, we are further pursuing using EMF as a potential alternative to growth factors. Our project involves designing an EMF generating device to test the effects of exposing bone marrow-derived mesenchymal stem cells (BMSCs) to EMF of intensity up to 1 mT. The EMF was generated by our Lee-Whiting 4-circular coil system, which was simulated in COMSOL Multiphysics and modeled in SolidWorks before 3D printing and assembling the device. The BMSCs were cultured in either base media or differentiation media under the exposure with or without EMF, forming four study groups. At the selected time points of 24 hours, weeks 1, 2 and 3, the BMSC proliferation and differentiation will be characterized by the quantification of cell density, total protein concentration, collagen secretion, calcium ion concentration and ALP activity. The cell study is ongoing currently and will be presented in the symposium.

Heart disease is a potent killer, claiming almost 650,000 lives annually in the U.S. alone. Studies show that endocannabinoids, lipid-derived intercellular signaling messengers, can potentially lower blood pressure and offer cardiac protection. Two muscarinic acetylcholine receptor subtypes (mAchR, M1/M3) have been shown to regulate endocannabinoid synthesis in the brain and digestive tract. Comparing endocannabinoid levels of 2-arachidonoyl-sn-glycerol (2-AG), anandamide (AEA), oleoylethanolamide (OEA) and palmitoylethanolamide (PEA) in the left ventricle of male M3 knockout mice that had either been food deprived or free feeding 24 hours prior to tissue harvest showed no significant difference. The endocannabinoid levels of male mice injected with atropine methyl nitrate, a nonspecific mAchR antagonist, also showed no significant difference when compared with those injected with a saline vehicle. However, studies have also shown that mAchRs are not always activated in the body. The experiment was done with a limited n value under conditions that may not have induced mAchR activation. Possible future tests with a mAchR agonist might also be needed to rule out its involvement in the endocannabinoid synthesis pathway in the heart.

The oleophilic hydrophobic graphite sponges were synthesized and developed to be used as novel and efficient means to separate clean water from contaminated oil/water. The highly porous architectures and compositions of these sponges can characterized by using the methods of BET, SEM, FTIR, XRD, and TEM. The superporous structure of this material has the huge potential to be used in catalytic industry. The possible functions of the sponge can also be growth substrate for plants. The graphitic sponge material can be separated from metal particles embedded by acid washing and filtration. The carbon matrix can be further utilized as electrochemical conducting additives carbon material in cathodes and anodes materials of batteries to increase the conductivity of the cathodes and anodes.