9TH ANNUAL UNDERGRADUATE RESEARCH, SCHOLARSHIP, AND CREATIVE ACTIVITY SYMPOSIUM

APRIL 28 & 29, 2015

3RD FLOOR HUB
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9TH ANNUAL UNDERGRADUATE RESEARCH, SCHOLARSHIP, AND CREATIVE ACTIVITY SYMPOSIUM

SCHEDULE OF EVENTS

ORAL PRESENTATIONS

TUESDAY, APRIL 28, 2015

8:00 – 8:55  HUB Lobby 3rd Floor
Registration & Poster Setup

9:10 – 10:00  Opening Session  HUB 302
Welcome  Richard Cardullo, Howard H Hays Chair, Faculty Director of University Honors and Associate Vice Provost of Undergraduate Education

“Romance, Rejection, Resilience, and Redemption in Research”
Panelists: Dr. Robert Nash Parker, Sociology; Dr. Gabriela Canalizo, Physics and Astronomy; Dr. Deborah Wong, Music; Dr. Victor Zordan, Computer Science and Engineering

WORKSHOP PRESENTATION - HUB 302
10:10  Going Global: Finding International Research Opportunities
Elizabeth Claassen Thrush, Educational Initiatives Coordinator, Undergraduate Education
Panelists: LaSharon McLean Perez, Professor Denver Graninger (History), Clint Collins (Graduate Student – Biology), Randy Truong (Undergraduate Student – Computer Science)

ORAL PRESENTATIONS
10:10-11:00  Session 1  HUB 355  Moderator: Dimitrios Morikis, Bioengineering

1a  Comparison between Carbon PEEK and Stainless Steel as a Bio-implantable Material
Afshin Jahromi, Bioengineering
Faculty Mentor: Nicole Zur Nieden, Cell Biology and Neuroscience

1b  Rho/ROCK Regulates Matrix Stiffening-dependent Endothelial Activation by Suppressing TRPV4
Boi Quach, Bioengineering
Faculty Mentor: Kaustabh Ghosh, Bioengineering

1c  Designing an in vitro Bistable Biological Circuit using RNA Aptamers
Claire Tran, Bioengineering
Faculty Mentor: Elisa Franco, Mechanical Engineering
10:10-11:00 Session 2 HUB 367 Moderator: Rebekah Richert, Psychology
2a Contradicting Personality Change Variables
   Stephen Doran, Psychology
   Faculty Mentor: William Dunlop, Psychology
2b Pronoun Usage by Doctors and Patients in Surgical Consultations
   Brandon Tran, Psychology
   Faculty Mentor: Kate Sweeney, Psychology

10:10-11:00 Session 3 HUB 379 Moderator: Emma Wilson, Biomedical Sciences
3a Group Sequential Clinical Trials for Gamma Distributions
   Kenneth Hsu, Statistics
   Faculty Mentor: Daniel Jeske, Statistics
3b Assessing Linguistic and Cultural Literacy among Saudi Arabian Students
   Clare O’Brien, Foreign Languages
   Faculty Mentor: Jeffrey Sacks, Comparative Literature
3c Fabrication of Silica Nanofibers for Nucleic Acid Extraction
   Marissa Gionet-Gonzales, Bioengineering
   Faculty Mentor: Wenwan Zhong, Chemistry

WORKSHOP PRESENTATION - HUB 302
11:10 Become a Cultural Ambassador through the Fulbright Program
   Gladis Herrera-Berkowitz, Director of Student Success Programs, Undergraduate Education
   Panelists: Dr. Deborah Wong, Music, Dr. Marissa Brookes, Political Science

ORAL PRESENTATIONS
11:10-12:00 Session 4 HUB 355 Moderator: Peter Sadler, Earth Sciences
4a The Effects of Four Biochars of Differing Particle Size Classes on Soil Water Retention Across Three Soil Textures
   Travis Hong, Environmental Science
   Faculty Mentors: Laosheng Wu, Environmental Sciences and Milt McGiffen, Botany and Plant Sciences
4b Search for All-Hadronic Gluino Decays at the LHC
   Connor Richards, Physics
   Faculty Mentor: Owen Long, Physics and Astronomy
4c Laboratory Fire Behavior Measurements of Chaparral Crown Fire
   Chirawat Sanpakit, Mechanical Engineering
   Faculty Mentor: Marko Princevac, Mechanical Engineering
11:10-12:00  Session 5  HUB 367  Moderator: Kurt Anderson, Biology
5a  Comparison of Sticky Silk Glands in Hatchling and Adult *Uloborus diversus* Spiders  
Marjorie Wimmer, Biological Sciences  
Faculty Mentor: Cheryl Hayashi, Biology

5b  Variable Response of Native Species to Nitrogen and Soil Inoculum from Native and Invasive Species  
Amanda Haraksin, Biology  
Faculty Mentor: Edith Allen, Botany and Plant Sciences

5c  Expression of a Moss Methyltransferase that Produces 3-O-Methyl-Galactosyl Residues in Transgenic Tobacco  
Rojin Ghobadi, Biology  
Faculty Mentor: Eugene Nothnagel, Botany and Plant Sciences

11:10-12:00  Session 6  HUB 379  Moderator: Kate Sweeny, Psychology
6a  More than Skin Deep: The Hidden Injustice that Compromises Our Health  
Melissa Mikail, Philosophy/Law and Society  
Faculty Mentor: Carl Cranor, Philosophy

6b  UCR Undergraduate Student-parents’ Perceptions of Campus Family-friendliness and their Academic Performance  
Roman Nunez, Sociology  
Faculty Mentor: Tanya Nieri, Sociology

6c  The Motivational Framework of Trans Activism  
Leah Rosario, Political Science  
Faculty Mentor: Katja Guenther, Sociology

12:00 – 1:00  Poster Sessions  HUB 302

**ORAL PRESENTATIONS**

1:10-2:00  Session 7  HUB 355  Moderator: Gregor Blaha, Biochemistry
7a  Are High-Activity Mice Resistant to Muscle Injuries?  
James Colbath, Biology  
Faculty Mentor: Theodore Garland, Biology

7b  Investigating the Mechanism of Antitumor Activity for a Polypyridyl Drug against Glioblastoma Tumors  
Catherine Elix, Biology  
Faculty Mentors: Jack Eichler, Chemistry and Emma Wilson, Biomedical Studies

7c  TREM2 Deficiency Decreases Hemispheric Swelling Following Traumatic Brain Injury without Affecting Astrogliosis or Microgliosis  
Geoffrey Pronovost, Biochemistry
Faculty Mentors: Andre Obenaus, Pediatrics and Monica Carson, Biomedical Sciences

1:10-2:00 Session 8 HUB 367 Moderator: Connie Nugent, Cell Biology and Neuroscience

8a Silk Gene Discovery in Male *Tengella perfuga* Spiders
   Liliana Alaniz, Biology
   Faculty Mentor: Cheryl Hayashi, Biology

8b Deprivation of Sugar or Yeast Extract Causes Change in Behavioral Taste Preferences as a Result of Modulation of Neurons in the Peripheral Taste Organs
   Vi-Khoi Duong, Cell, Molecular and Developmental Biology
   Faculty Mentor: Anupama Dahanukar, Entomology

8c Social Disadvantage and Life Expectancy in California Counties
   Denise Huipio, Sociology
   Faculty Mentor: Augustine Kposowa, Sociology

**WORKSHOP PRESENTATION - HUB 302**

2:10 Introduction to National Prestigious Scholarships and Awards
   Gladis Herrera-Berkowitz, Director of Student Success Programs, Undergraduate Education
   Panelists: Robin Russin, Theatre (Rhodes Scholar), Dr. Leonard Mueller, Chemistry (Churchill Scholar), Tiffany Tai, (Peace Corps)

**ORAL PRESENTATIONS**

2:10-3:00 Session 9 HUB 355 Moderator: Vorris Nunley, English

9a Representations of Californios and Californian Indians: Perspectives of Social Dominance from 1790 to 1910
   Alejandro Echeverria, Anthropology/Spanish
   Faculty Mentor: Covadonga Lamar Prieto, Hispanic Studies

9b The Genocide of the California Native Americans in 1846-1870 as supported by the 1948 UN Genocide Convention
   Itzel Cortes, Spanish/Linguistics
   Faculty Mentor: Covadonga Lamar Prieto, Hispanic Studies

9c Elite Alta California Women in the Nineteenth Century: Recuperating their Agency
   Sandra Bellén Galeas, Spanish Linguistics
   Faculty Mentor: Covadonga Lamar Prieto, Hispanic Studies

2:10-3:00 Session 10 HUB 367 Moderator: Christine Gailey, Anthropology

10a Extent of and Barriers to Campus Involvement among Student-Parent Undergraduates at UCR
   Anna Sanchez, Sociology/Law and Society
Faculty Mentor: Tanya Nieri, Sociology

10b Fighting for Inclusion: The Chicano Experience at the University of California
   Anthony Victoria, History
   Faculty Mentor: V.P. Franklin, History

10c “Living the Promise” at UCR, Institutional Discourse within the Media, the University, and Public: The Praxis of Erasure within the Intersectionality of Identity
   Sarah Doyle, Media and Cultural Studies
   Faculty Mentor: Yolanda Moses, Anthropology

2:10-3:00 Session 11 HUB 379 Moderator: Richard Cardullo, Biology
11a How do Spanish-speaking Women Subjectively Experience the Sexuality in Zumba Fitness?
   Christine Munoz, Sociology
   Faculty Mentor: Tanya Nieri, Sociology

11b University Students Attitudes and Behaviors towards Cognitive Enhancement Drugs
   Nicole Perez, Psychology/Music
   Faculty Mentor: Kate Sweeny, Psychology

11c Ultrastructural and Chemical Analysis of Chiton Feeding Apparatus
   Jeffrey Geiger, Chemical Engineering
   Faculty Mentor: David Kisailus, Chemical and Environmental Engineering

Workshop Presentations - HUB 302
3:10 The Nuts and Bolts of Applying to Graduate School
   Maria Franco Aguilar, Director of Academic Preparation & Outreach, Graduate Division

4:10 Using the UCR Undergraduate Research Portal
   Christine Victorino, Assistant Vice Provost, Undergraduate Education
SCHEDULE OF EVENTS

ORAL PRESENTATIONS

WEDNESDAY, APRIL 29, 2015

9:00 – 9:55 HUB Lobby 3rd Floor
Registration

WORKSHOP PRESENTATIONS - HUB 302
9:10 R’Courses: Extending and Sharing your Research through Democratic Education
Elizabeth Claassen Thrush, Educational Initiatives Coordinator, Undergraduate Education
Panelists: Colette King (R’Course Student Intern and former Facilitator), Cynthia Contreras (Current Student Facilitator), and Alberto Tam Yong (Current Student Facilitator)

10:10 Applying for a Goldwater Scholarship
Gladis Herrera-Berkowitz, Director of Student Success Programs, Undergraduate Education
Panelists: Dr. W. Hill Harman, Chemistry; Dr. Catherine Larsen, Chemistry, Geoffrey Pronovost, Biochemistry, Connor Richards, Physics, Julianne Rolf, Chemical and Environmental Engineering

ORAL PRESENTATIONS
10:10-11:00 Session 12 HUB 355 Moderator: Erith Jaffe-Berg, Theatre
12a A Stray Princess: Composing Music for a Fantasy Story Containing a Prominent Female Hero
Jacqueline Wong, English
Faculty Mentor: Tim Labor, Music

12b Once More Unto the Longboats: A Creative Re-imagining of Norse Lore Through Modern Prose Fiction
Charlotte Ann Kane, Creative Writing
Faculty Mentor: Nalo Hopkinson, Creative Writing

12c Márquez’s Cosecha: Stories of Guanajuato
Ivan Copado, Creative Writing
Faculty Mentor: Michael Jayme, Creative Writing

10:10-11:00 Session 13 HUB 367 Moderator: Dana Simmons, History
13a The Mobile Gaze in Gorge Sand’s Indiana: Modern Women’s Consciousness
Yueran Tian, Comparative Literature
Faculty Mentor: Heidi Brevik-Zender, Comparative Literature & Foreign Languages
The German Nazi Party’s Lebensborn Program in Norway
Anne-Lise Helland, Anthropology
Faculty Mentor: Christine Ward Gailey, Anthropology

Doctor-Patient Communication
Emily Lopez, Anthropology
Faculty Mentor: Juliet McMullin, Anthropology and T.S. Harvey, Anthropology

“A Princely Expenditure of Time”: Riverside Polo and Lawn Tennis as Conspicuous Leisure
Nicole De Silva, History/Business Administration
Faculty Mentor: Catherine Gudis, History

Fighting Risks: Beyond the Physical in MMA
Alina Muradyan, Anthropology
Faculty Mentor: Juliet McMullin, Anthropology

Triggering uprisings and Regime Change through Political Assassinations
Mark Forde, Political Science/International Relations
Faculty Mentor: David Pion-Berlin, Political Science

CVD Growth and Characterization of Single Layer MoS2 on Patterned Substrates
Sahar Naghibi, Chemistry
Faculty Mentor: Ludwig Bartels, Chemistry

The Synthesis and Biological Testing of Cupric Phenanthroline Complexes: An Alternative to Cisplatin?
Noah Angel, Chemistry
Faculty Mentor: Jack Eichler, Chemistry

Relationship between the Trajectory of Mid-latitude Cyclones in the Eastern Pacific Ocean and the Isotopic Composition of Snowfall in the Sierra Nevada
Krystal Vasquez, Chemistry
Faculty Mentor: James Sickman, Environmental Science

Investigating Morphological Changes of Astrocytes and their Role in the Influx of Leukocytes during Toxoplasma gondii Infection
Elma Frias, Neuroscience/Music
Faculty Mentors: Emma Wilson, Biomedical Sciences, Devin Binder, Biomedical Sciences, Todd Fiacco, Cell Biology and Neuroscience

17b  The Role of the Autophagy Pathway in Histone Turnover in the Human Malaria Parasite
     Christopher Conner, Biological Sciences
     Faculty Mentor: Karine Le Roch, Cell Biology and Neuroscience

17c  Heterologous Replicase Driven 3’ End Repair of *Cucumber mosaic virus* Satellite RNA
     Erika Varady, Biology
     Faculty Mentor: A.L.N. Rao, Plant Pathology and Microbiology

**WORKSHOP PRESENTATIONS - HUB 302**

1:30  Using the UCR Undergraduate Research Portal
     Christine Victorino, Assistant Vice Provost, Undergraduate Education

2:10  Working Scholars: Pursuing Academic Study and Professional Engagement through Internships
     Kathleen Sawa, Academic Internship Coordinator, Undergraduate Education

**ORAL PRESENTATIONS**

2:10-3:00  Session 18  HUB 355  Moderator: Richard Cardullo, Biology

18a  Examining the ICC from a Restorative Justice Perspective
     Gloria Kyallo, Political Science
     Faculty Mentor: Bronwyn Leebaw, Political Science

18b  The Truth, Justice, and Reconciliation Commission in Mali: A Comparative Approach to Analyzing the Role of Local Responsibility and Truth-telling
     Bianca Freeman, Political Science/Middle East and Islamic Studies
     Faculty Mentor: Bronwyn Leebaw, Political Science

18c  Street Gangs and Violence in Central America: The Effectiveness of Political Responses
     Stephanie Herrera, Political Science
     Faculty Mentor: David Pion-Berlin, Political Science

2:10-3:00  Session 19  HUB 367  Moderator: Curt Burgess, Psychology

19a  Our Take on Terrorism: From Childhood to Adulthood
     Shirley Leanos, Psychology
     Faculty Mentor: Rebekah Richert, Psychology

19b  Influence of Technology among Californians in 2014
     Sina Hananian, Biology
     Faculty Mentor: Bradley White, Entomology
19c  Influences of Religiosity and Spirituality on Waiting Experiences  
Maria Ramirez Loyola, Psychology  
Faculty Mentor: Kate Sweeny, Psychology

2:10-3:00  Session 20  HUB 379  Moderator: Peter Sadler, Earth Sciences
20a  Survey of Popular Perceptions of China: A Conundrum  
Julie Ngo, Comparative Literature & Foreign Languages/Chinese  
Faculty Mentor: Christopher Chase-Dunn, Sociology

20b  Evolution of the GATA Family of Transcription Factors in Nematodes  
Christian Turner, Cell, Molecular, and Developmental Biology  
Faculty Mentor: Morris Maduro, Biology

20c  The Genetic Basis of Body Color Variation in the African Malaria Mosquito  
Stephanie Gamez, Biology  
Faculty Mentor: Bradley White, Entomology

3:10-4:00  Session 21  HUB 355  Moderator: Rebekah Richert, Psychology
21a  One Planet, One Home, One Responsibility  
Sandor Nagy, Global Studies  
Faculty Mentor: Christopher Chase-Dunn, Sociology

21b  Understanding Eating Habits and Well-being among Female Latino Adolescents and Their Parents  
Sandra Alami, Psychology  
Faculty Mentor: Cixin Wang, Graduate School of Education

21c  Nonverbal Cues and Person Perception in an Uncertain Situation  
Katayoun Tehrani, Psychology  
Faculty Mentor: Kate Sweeny, Psychology

3:10-4:00  Session 22  HUB 367  Moderator: Steven Axelrod, English
22a  The “Three Teachings” in Chinese poetry: Reading Wang Wei and Li Bo  
Keely Smith, Comparative Literature & Foreign Languages  
Faculty Mentor: Yang Ye, Comparative Literature & Foreign Languages

22b  Linear and Cyclic Constructions of Time in Sir Gawain and the Green Knight  
Sarah Folk, English  
Faculty Mentor: John Ganim, English

22c  The Repurposing of Childhood Memory in the Creation of Identity in Sylvia Plath’s Fictive and Non-Fictive Literature  
Alexis Dennis, English  
Faculty Mentor: John Ganim, English
4:00 – 5:00    Closing Session    HUB 302

Presentation of Best Oral and Poster Presentation Awards
Recognition of National Award Recipients
Closing Remarks
## Schedule of Events

### Poster Presentations

**Tuesday, April 28, 2015**  
**HUB 302**

### School of Business Administration/College of Humanities, Arts, and Social Sciences

| A 01 | Fantasy Perception as a Measure of Successful Transfer in Children's Media  
Eva M. Perez-Cecenas, Business Administration, David Oros, Psychology, Eugene P. Vaudry, Psychology  
Faculty Mentor: Rebekah Richert, Psychology |
| A 02 | Age and Gender Differences in Anthropomorphizing  
Marsha Tanare, Psychology and Jennifer Hernandez, Psychology  
Faculty Mentor: Rebekah Richert, Psychology |
| A 03 | Women's Futurity at World's Fairs in the United States, 1876 to 1965  
Deanne Elliot, History/Political Science  
Faculty Mentor: Molly McGarry, History |
| A 04 | Within the Hegemonic Paradigm: The Non-Dominant Narratives and Representation of LGBTQ Communities of Color in the 21st Century Digital Public Sphere  
Sarah Doyle, Media and Cultural Studies  
Faculty Mentor: Lan Duong, Media and Cultural Studies |
| A 05 | Cross-Continental Comparison of Nicotine Labeling Accuracy in Electronic Cigarette Refill Fluids  
Iliana Cordova, Psychology  
Faculty Mentor: Prue Talbot, Cell Biology and Neuroscience |

### College of Natural and Agricultural Sciences/Bourns College of Engineering

| A 06 | Video Bioinformatics Analysis of Electronic Cigarette-Induced Oxidative Stress and Mitochondrial Morphology  
Rattapol Phandthong, Biochemistry  
Faculty Mentor: Prue Talbot, Cell Biology and Neuroscience |
A 07  Functional Role of β2Chn in Granule Cell Migration: Understanding the Mechanisms Underlying Cerebellar Development  
Abhinandan Pabla, Cell, Molecular and Developmental Biology/Neuroscience  
Faculty Mentor: Martin Riccomagno, Cell Biology and Neuroscience

A 08  Evaluating the Link between Measures of Body Size and Evolutionary Fitness in Female Drosophila Melanogaster  
Fransiska Lee, Biology  
Faculty Mentor: Leonard Nunney, Biology

A 09  Utilizing qPCR to Determine Expression Levels of par2-like Sequences Thought to Play a Role in Sperm Motility of Mosquitos  
Allie SteinerLund, Biology  
Faculty Mentor: Richard Cardullo, Biology

A 10  Effect of 3-O-Methylation of Cell Wall Galactosyl Residues on Desiccation Tolerance of Leaves from Transgenic Tobacco Plants  
Allison Cid, Microbiology  
Faculty Mentor: Eugene Nothnagel, Botany and Plant Sciences

A 11  Organ Localization of a Methylated Cell Wall Sugar in Transgenic Tobacco Expressing a Moss Methyltransferase Gene  
Bijan Sasaninia, Microbiology  
Faculty Mentor: Eugene Nothnagel, Botany and Plant Sciences

A 12  Effects of Housing at Differential Temperatures on Energetics and Performance in the California Mice  
Allison Ibarra, Biological Sciences  
Faculty Mentor: Wendy Saltzman, Biology

A 13  Elucidating the TBP-TATA Binding Dependency of the Human β-actin Gene Promoter  
Elsie Gonzalez-Hurtado, Biochemistry  
Faculty Mentor: Ernest Martinez, Biochemistry

A 14  Characterizing the Interactions between High Mobility Group AT-Hook 1 (HMGA1) and TFIIID and Mediator Complexes  
Alexia King, Biochemistry  
Faculty Mentor: Ernest Martinez, Biochemistry

A 15  Hand Hygiene: Effects of Hand Washing vs. Hand Sanitizing  
Gurjot Walia, Biology  
Faculty Mentor: Emma Simmons, Biomedicine

A 16  Effects of Primary Productivity on the Dynamics of Spatially Assembled Communities with Omnivory  
Heather David, Microbiology  
Faculty Mentor: Kurt Anderson, Biology
A 17  Monolayer Molybdenum Disulfide Growth over SiO2/Si Trench-Patterned Wafers  
Ingrid Liao, Chemistry  
Faculty Mentor: Ludwig Bartels, Chemistry

A 18  Synthesis and Characterization of Monolayer MoS2 on Graphene and Different Substrates  
Justin Chung, Chemistry  
Faculty Mentor: Ludwig Bartels, Chemistry

A 19  Deciphering Rice Developmental Plasticity in Response to Water  
Kevin Oda, Biology and Kelly Tran, Biology  
Faculty Mentor: Julia Bailey-Serres, Botany and Plant Sciences

A 20  Generating START-protein Overexpression Arabidopsis Thaliana Lines  
Ryan Assali, Biology  
Faculty Mentor: Sean Cutler, Botany and Plant Sciences

A 21  Design and Synthesis of Novel Metal-Organic Frameworks Material  
Carmen Aguilar, Chemistry  
Faculty Mentor: Pingyun Feng, Chemistry

A 22  Effects of Early Processes on Lotus japonicus  
Glenna Stomackin, Biology  
Faculty Mentor: Joel Sachs, Biology

A 23  Perinatal Exposure to Brominated Flame Retardants Alters Social Memory, Repetitive Behavior and Hyperactivity Concomitant with Changes in Plasma Vasopressin in Adult Male Mice  
Gwendolyn Gonzalez, Neuroscience  
Faculty Mentor: Margarita Curras-Collazo, Cell Biology and Neuroscience

A 24  Developmental Exposure to Indoor Flame Retardants Disrupt Sympathetic and Hypothalamic-Pituitary-Adrenal (HPA) Axis Activity in Osmotic Challenged Rats  
Roberto Gutierrez, Biochemistry  
Faculty Mentor: Margarita Curras-Collazo, Cell Biology and Neuroscience

A 25  Synthesis of 2-Alkyl-Quinolines for Anti-Cancer Testing  
Jennifer An, Chemistry  
Faculty Mentor: Catharine Larsen, Chemistry

A 26  Ethanol Effects on p53 Mediated Inhibition of Id2 Expression  
Juan Sanabria, Neuroscience  
Faculty Mentor: Kelly Huffman, Psychology

A 27  Jet Studies on the MPC-EX Pre-shower Detector Upgrade to the PHENIX Experiment  
Lucas Flores, Physics/Applied Mathematics  
Faculty Mentor: Richard Seto, Physics and Astronomy
A 28  Search for Supersymmetry at the LHC in Direct Top Squark Production with many Jets and Large Missing Transverse Energy in the Final State  
Martha Nunez, Physics/Applied Mathematics  
Faculty Mentor: Bill Gary, Physics and Astronomy

A 29  Role of EphrinB1 Signaling in Astrocytes  
Michael Garcia, Biology  
Faculty Mentor: Iryna Ethell, Biomedical Sciences

A 30  Characterizing the SUMOylation Pathway Inhibitor (STE) and its Derivative  
Myra Etuale, Biochemistry  
Faculty Mentor: Jiayu Liao, Bioengineering

A 31  Novel MicroRNAs Potentially Enhance Osteogenesis in Hyperglycemic mESCs  
Nicholas Ventura, Cell, Molecular and Developmental Biology  
Faculty Mentor: Nicole Zur Nieden, Cell Biology and Neuroscience

A 32  Prefrontal Circuitry Supports Fear Memory Accuracy and Generalization  
Niusha Bavadian, Neuroscience  
Faculty Mentor: Edward Korzus, Psychology

A 33  Relative Expression of Ecdysis Triggering Hormone (ETH) Transcript and Receptor Subtypes A and B in Adult Drosophila melanogaster  
Raymond-Tan Tran, Neuroscience  
Faculty Mentor: Michael Adams, Cell Biology and Neuroscience

A 34  Study of "Secreted Protein, Acidic, Rich in Cysteine" (SPARC) During Inflammatory Immune Response to Toxoplasma  
Allen Justine Dalisay, Bioengineering  
Faculty Mentor: Emma Wilson, Biomedical Sciences

A 35  Rice Husk: A Sustainable Building Material in the Philippines  
Lamees Alkhamis, Environmental Engineering  
Faculty Mentor: Kawai Tam, Chemical and Environmental Engineering
SCHEDULE OF EVENTS

POSTER PRESENTATIONS

WEDNESDAY, APRIL 29, 2015
HUB 302

SCHOOL OF BUSINESS ADMINISTRATION/COLLEGE OF HUMANITIES, ARTS, AND SOCIAL SCIENCES

B 01  Do You Have Friends? Early Friendship Concept and Quality in Children with Autism Spectrum Disorder
      Ashley Mallard, Political Science
      Faculty Mentor: Jan Blacher, Graduate School of Education

B 02  Pattern Classification of EEG Signals during Visual Statistical Learning
      Tiffany Wong, Psychology, Julieanne Ong, Psychology, David Shoup, Psychology
      Faculty Mentor: Aaron Seitz, Psychology

B 03  God Comforts Me: Parent’s and Children’s Views of God’s Emotional Properties
      Valita Chailert, Psychology and Albert L. Ly, Psychology
      Faculty Mentor: Rebekah Richert, Psychology

B 04  Children’s Understanding of and Adherence to Asthma Treatment
      Haydi Gerges, Psychology
      Faculty Mentor: Rebekah Richert, Psychology

B 05  The Influence of Dominant Language on Children’s Cognitive Development
      Nikta Jaberdzadeh, Psychology
      Faculty Mentor: Rebekah Richert, Psychology

B 06  Cowtown: A Novella
      David Kopp, Creative Writing
      Faculty Mentor: Brandon Williams, Creative Writing

B 07  It’s Not What You Say But How You Say It: Vocal Tone and Emotion Among Women Coping with Breast Cancer
      Matthew Leitao, Psychology
      Faculty Mentor: Megan Robbins, Psychology
B 08 Student Debt and its Relationship to Diversity
Rachel Tennell, African American Studies
Faculty Mentor: Nick Mitchell, Ethnic Studies

B 09 Social Media Marketing: Analyzing the Current Ethics, Regulations, and Profiles that Target United States Minors
Kara Homolak, Business Administration
Faculty Mentor: Sherryl Berg-Ridenour, Business Administration

**COLLEGE OF NATURAL AND AGRICULTURAL SCIENCES/BOURNS COLLEGE OF ENGINEERING**

B 10 In Situ Observation of the Electrochemical Lithiation of Polysilicon Thin Films
Cody Gonzalez, Mechanical Engineering
Faculty Mentor: Sandeep Kumar, Mechanical Engineering

B 11 Drug Delivery into Cells by Selective Cavitand-Mediated Endocytosis
Jessica Arguelles, Bioengineering
Faculty Mentor: Richard Hooley, Chemistry

B 12 Testing and Design of Benchtop Coulter Counter
Madeline Mullen, Bioengineering
Faculty Mentor: William Grover, Bioengineering

B 13 NOx-Out: Selective Catalytic Reduction Technology for Small Off-Road Engines
Alyssa Yan, Environmental Engineering
Faculty Mentor: Kawai Tam, Chemical and Environmental Engineering

B 14 Rice Husk: A Sustainable Building Material
Colin Eckerle, Environmental Engineering
Faculty Mentor: Kawai Tam, Chemical and Environmental Engineering

B 15 Effect of NOx-Out Device on Fuel Consumption and Differential Pressure of Small Off-Road Engines
Priyanka Singh, Chemical Engineering
Faculty Mentor: Kawai Tam, Chemical and Environmental Engineering

B 16 Determining the Mode of Action of a SUMOylation Inhibitor
Anh-Tho Duong, Bioengineering
Faculty Mentor: Jiayu Liao, Bioengineering

B 17 Significance of Aquaporin 3 in Pancreatic Cancer Cell Susceptibility to Exogenous Hydrogen Peroxide Therapy
Andrew Huang, Neuroscience
Faculty Mentor: Victor Rogers, Bioengineering
| B 18 | Exploring Fed-Batch Systems for the Simultaneous Saccharification and Fermentation (SSF) of CELF-Pretreated Corn Stover  
Anna Almario, Chemical Engineering  
Faculty Mentor: Charles Wyman, Chemical and Environmental Engineering |
| B 19 | Identification of Antioxidant Regions in Amyloid Beta through Radical-Directed Dissociation Mass Spectrometry  
Arman Alizadeh, Biochemistry  
Faculty Mentor: Ryan Julian, Chemistry |
| B 20 | The Effects of Astrocytic Potassium Buffering on Epileptiform Hysteresis  
Casey Nguyen, Neuroscience  
Faculty Mentor: Maxim Bazhenov, Neuroscience |
| B 21 | CVD Growth and Characterization of Single Layer MoS2, MoSe2, and MoS2(1-x)Se2x  
Christopher Lee, Chemistry  
Faculty Mentor: Ludwig Bartels, Chemistry |
| B 22 | An Alternative Estimation of the Logistic Regression Model Parameters  
Gabriel Ruiz, Statistics  
Faculty Mentor: Subir Ghosh, Statistics |
| B 23 | Evaluation of Hygiene Kits Usage and Satisfaction of Riverside Free Clinic Patients for Improving Their Overall Health and Quality of Life  
Jessica Nguyen, Biological Sciences  
Faculty Mentor: Subir Ghosh, Statistics |
| B 24 | Single Molecule Force Mechanics of Protein Interactions  
Jesus Garcia, Biochemistry  
Faculty Mentor: Valentine Vullev, Bioengineering |
| B 25 | Increasing 2-(2’-pyridyl) Quinoline Reaction Yields to Facilitate Gold(III) Catalysis  
Lisa Bishop, Chemistry  
Faculty Mentor: Catharine Larsen, Chemistry |
| B 26 | Effects of Parental Status on Male Body Composition and Diet Preference in the Biparental California Mouse  
Lorraine Horwitz, Biochemistry  
Faculty Mentor: Wendy Saltzman, Biology |
| B 27 | Novel Binding Site for the MYC Oncoprotein, Prevalent in Human Cancers  
Michael Allevato, Biochemistry  
Faculty Mentor: Ernest Martinez, Biochemistry |
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<td>Solving the Phase Problem from Few and Noisy Data</td>
<td>Sarah Allec, Applied Math.</td>
<td>Mathematics</td>
<td>James Kelliher, Mathematics</td>
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SCHEDULE OF EVENTS

CONCURRENT WORKSHOP PRESENTATIONS

TUESDAY, APRIL 28, 2015
HUB 302

10:10  Going Global: Finding International Research Opportunities
Join UCR students, faculty, and staff to learn more about research opportunities abroad. This
workshop will highlight experiences from past participants, opportunities for scholarships, and
featured research programs in a variety of countries.
Lead Presenter: Elizabeth Claassen Thrush, Educational Initiatives Coordinator, Undergraduate
Education
Panelists: LaSharon McLean Perez, Professor Denver Graninger (History), Clint Collins (Graduate
Student – Biology), Randy Truong (Undergraduate Student – Computer Science)

11:10  Become a Cultural Ambassador through the Fulbright Program
Fulbright provides opportunities around the world for students interested in teaching English or
conducting research. Come learn about the mission of the Fulbright, available opportunities, and how
to prepare for the application process.
Lead Presenter: Gladis Herrera-Berkowitz, Director of Student Success Programs, Undergraduate
Education
Panelists: Dr. Deborah Wong, Music, Dr. Marissa Brookes, Political Science

2:10  Introduction to National Prestigious Scholarships and Awards
This workshop will introduce students to national awards and scholarships. Learn what makes a
competitive applicant, identify the award that is “right” for you, and prepare to apply.
Lead Presenter: Gladis Herrera-Berkowitz, Director of Student Success Programs, Undergraduate
Education
Panelists: Robin Russin, Theatre (Rhodes Scholar), Dr. Leonard Mueller, Chemistry (Churchill Scholar),
Tiffany Tai (Peace Corps)

3:10  The Nuts and Bolts of Applying to Graduate School
Mystified about the graduate application process? Learn how the general graduate application
process works and how to get a head start on YOUR applications now.
Lead Presenter: Maria Franco-Aguilar, Director of Academic Preparation & Outreach, Graduate Division

4:10  Using the UCR Undergraduate Research Portal
UCR has a new tool to facilitate the connection between students and faculty to identify research
opportunities. Come learn how to use this tool.
Lead Presenter: Christine Victorino, Assistant Vice Provost, Undergraduate Education
WEDNESDAY, APRIL 29, 2015
HUB 302

9:10 R’Courses: Extending and Sharing your Research through Democratic Education
UCR students now have the opportunity to develop their own original courses! Students work with a faculty mentor to create a syllabus, find resources, and offer a course to other undergraduates. This workshop will give you the tools to develop your own proposal to offer a course next year.
Lead Presenter: Elizabeth Claassen Thrush, Educational Initiatives Coordinator, Undergraduate Education
Panelists: Colette King (R’Course Student Intern and former Facilitator), Cynthia Contreras (Current Student Facilitator), and Alberto Tam Yong (Current Student Facilitator)

10:10 Applying for a Goldwater Scholarship
The Goldwater Scholarship provides $7,500 to sophomores and junior recipients who demonstrate outstanding potential and intend to pursue research careers in mathematics, the natural sciences, or engineering. Come learn about the mission of the award, how to prepare, and what to expect from the application process.
Lead Presenter: Gladis Herrera-Berkowitz, Director of Student Success Programs, Undergraduate Education
Panelists: Dr. W. Hill Harman, Chemistry; Dr. Catherine Larsen, Chemistry, Geoffrey Pronovost, Biochemistry, Connor Richards, Physics, Julianne Rolf, Chemical and Environmental Engineering

1:30 Using the UCR Undergraduate Research Portal
UCR has a new tool to facilitate the connection between students and faculty to identify research opportunities. Come learn how to use this tool.
Lead Presenter: Christine Victorino, Assistant Vice Provost, Undergraduate Education

2:10 Working Scholars: Pursuing Academic Study and Professional Engagement through Internships
Internships are among the top reasons for hiring a recent graduate. Learn about your options for receiving academic credit while developing your professional portfolio through participation in either UCDC, UCCS, or a Major-Specific Internship Program in the community (MSIPS). Hear from a panel consisting of faculty and students who have distinguished themselves by participating in one or more of the programs Undergraduate Education has to offer.
Lead Presenter: Kathleen Sawa, Academic Internship Coordinator, Undergraduate Education
ABSTRACTS

Carmen Mayela Aguilar, Chemistry
Faculty Mentor: Pingyun Feng, Chemistry
Design and Synthesis of Novel Metal-Organic Frameworks Material

Due to raised awareness of the constant pollution of our air there has resulted a newfound interest in finding a solution for capturing carbon dioxide in the atmosphere. The designing of metal organic frameworks, MOFs, with carbon dioxide selective adsorption properties could help find a solution to this problem. MOFs have become important in finding alternatives to capturing carbon dioxide before it is released into the air. Comparing with some traditional materials for adsorbing carbon dioxide, such as amine solutions and active carbon, MOFs have shown to have several unique features: tunable pore size and window making it suitable to trap CO2 molecules, utilization of open metal sites, and introduction of polarizing functional groups of ligands. In addition, pore partition is an intriguing way for trapping carbon dioxide molecules. To realize these target structural features, we introduce 5-Trizelyisophthalic acid (H2TrZI) as our ligand. Different functional groups prefer coordinating with metal cations that have different properties based on the “Hard-Soft-Acid-Base” principle. Indium cations can coordinate with the carboxylic functional groups of the isophthalic part to give zeolite cages, which has been proved before. The triazole groups can bond with transition metal cations to give another secondary building unit (SBU). In this way, the large cages can be separated into smaller spaces that may be suitable for capturing CO2 molecules. After testing gas adsorption properties, we can study the relationships between structures and CO2 adsorption properties. Once these properties are related then finding a proper MOF for CO2 adsorption would be in reach.

Sandra Alami, Psychology
Faculty Mentor: Dr. Cixin Wang, Graduate School of Education
Understanding Eating Habits and Well-being among Female Latino Adolescents and Their Parents

There is currently little research on eating disorders among Latino American adolescents. While eating disorders were traditionally understood to be disorders of European or European American woman, research has found that girls and women of ethnic minorities develop eating disorders as well (Cachelin, Phinney, Schug, & Striegel-Moore, 2006). Eating disorders do occur in Latino American women, and the prevalence is similar to that reported for White populations (Cachelin et al., 2006). A better understanding of eating disorders among Latino American adolescents can lead to the development of culturally appropriate treatments for those Latino Americans who have eating disorders. By interviewing Latino American adolescents and their parents, this study aims to gain a deeper understanding of perceptions of eating disorders among this population as well as information related to stigma and help-seeking behaviors. The data collected from these interviews can be used to develop a community based psychoeducation workshop that provides information about eating disorder symptoms and warning signs as well as information about how to help a friend or classmate who might be showing signs of an eating disorder. This workshop would also encourage help-seeking behaviors.
Liliana Alaniz, Biology  
Faculty Mentor: Dr. Cheryl Y. Hayashi, Biology  
Silk Gene Discovery in Male *Tengella perfuga* Spiders

An individual spider can produce multiple silk types, with each silk type synthesized in its own set of differentiated silk glands. Spider silks are composed mostly of spidroins (spider fibroins), which are encoded by a gene family. Because female spiders tend to be larger and have longer lifespans than male spiders, nearly all studies on spidroins have been conducted on females. Thus, virtually nothing is known about the spidroins produced by male spiders. At sexual maturity, male spiders are thought to give up feeding and wander in search of mates. Therefore, we hypothesized that mature males will cease producing spidroins involved in prey capture. It’s also possible that spidroins exclusively used by males exist. Unlike many spider species, males of the Central American spider *Tengella perfuga* are similar in size to females (13.85 mm body length), making them a practical choice for silk gland dissection. Male *T. perfuga* have conspicuous ampullate shaped glands and a set of smaller, less distinctly shaped glands. We constructed separate cDNA libraries from these two tissue types. We sequenced the libraries and identified three spidroin paralogs (gene family members). Phylogenetic analyses grouped two paralogs with major ampullate spidroins (used for draglines and web construction) and the third with aciniform spidroins (used for prey-wrapping). These findings falsify our hypothesis that males will not produce any spidroins involved in prey capture. One of the male major ampullate paralogs matches a cDNA from female *T. perfuga*, while the other is novel, supporting the hypothesis of sex-specific spidroin expression.

Arman Alizadeh, Biochemistry  
Faculty Mentor: Dr. Ryan Julian, Chemistry  
Identification of Antioxidant Regions in Amyloid Beta through Radical-Directed Dissociation Mass Spectrometry

Aggregation of the antioxidant peptide Amyloid Beta (Aβ) has been linked to the formation of Amyloid plaques which are believed to cause Alzheimer’s disease. Previously, our laboratory demonstrated that antioxidant peptides will sequester radicals in the gas phase resulting in a lack of radical-directed fragmentation. This correlates well with solution phase antioxidant capacity and can be used to identify novel antioxidant peptides. Using this technique, Aβ was confirmed as an antioxidant contrary to what was expected as Aβ contains multiple aromatic sites and serines which are favorable radical fragmentation sites. We hypothesize that the sequestering site can be isolated to a specific region of Aβ. Examining the radical sequestering strength of separate fragments of Aβ will allow us to determine their overall impact on the antioxidant strength of the peptide. The goal of this research is to provide more information on the properties of Aβ in the hope that it will eventually lead to an advancement in the treatment of Alzheimer’s disease.
Husk-to-Home, a senior design group, was tasked to produce a particleboard from rice husk and non-formaldehyde emitting adhesives. The team was able to produce two types of boards where one uses a tannin-based adhesive and the other uses casein-based adhesive. Both boards were produced using a hydraulic press at pressures up to 0.25MPa. The boards were tested for mechanical properties including the peak load, which is also known as flexural strength, following the American Society of Testing and Materials (ASTM) D1037 - 99 testing standard. The results show that a tannin-based board has a peak load of 20 lbf, and a casein-based board has a peak load of 17.64 lbf. The boards were also tested for water resistivity as particleboards need to be sufficiently water resistant to maintain their viability. Using the ASTM D1037 - 99 testing standard, square sample boards of 1” × 1” were soaked in water at room temperature for 2 and 24 hours to evaluate short- and long-term changes. The casein-based board showed an expansion of 22.5% for the 2-hour test and a 28.6% expansion for the 24-hour test. The tannin-based board, however, ended up disintegrating and no conclusive results were acquired for the soak test. Lastly, termite testing (bioassay) was performed on pure rice husks and basswood (control) to investigate how resistant rice husk is to termite damage. Results indicate that termites will not feed on rice husk. This demonstrates the potential for using rice husks for the making of termite-resistant particleboards viable.

Determine the structure of biomolecules is a fundamental goal of modern biology. To the extent that the phase problem can be solved, progress is generally made in molecular biology, as exemplified by the results of crystallography over the past century. However, due to the difficulty in preparing crystals for most proteins, the domain of applicability of crystallography is limited. Thus the requirement emerges for extending the methods of crystallography to non-crystalline objects. Progress in several fields over the past three decades has opened the door to realizing this goal through a variety of experimental and computational techniques that together form the field of lensless imaging. For example, advances in accelerator physics, such as the development of large-scale X-ray free electron lasers, has enabled the realization of diffract-and-destroy techniques that have yielded the successful structural determination of virions and nanocrystals. Additionally, algorithmic developments have enabled the routine phasing of diffraction patterns from amorphous objects. However, such methodologies remain limited by the beam flux which remains insufficient to determine the three dimensional structure of biomolecules. To address this limitation, we and others previously developed an algorithm, called Adaptive Phase Retrieval (APR) that requires less diffraction data to solve the phase problem for amorphous objects. This computational framework applies to typical amorphous objects and can be extended to include prior knowledge when it is available. Here I report new results for solving the phase problem with noisy and incomplete data by using APR.
Michael Allevato, Biochemistry  
Faculty Mentor: Ernest Martinez, Biochemistry  
Mark Grossman, Eugene Bolotin, Frances Sladek  
Department of Biochemistry and Cell Biology & Neuroscience  
Novel Binding Site for the MYC Oncoprotein, Prevalent in Human Cancers

MYC is a transcription factor associated with numerous cell developmental functions such as cell cycle progression, angiogenesis, and apoptosis. The overexpression of MYC is a key element in the genesis of many cancers. Due to its oncogenic activities, it is a promising target for novel therapeutic treatments. MYC binds DNA at specific sequences termed Enhancer boxes (E-box), upstream of the promoter. An E-box is designated as a sequence consisting of CANNTG (N can be any nucleotide). MYC generally binds E-box sequences (CACGTG). I have investigated the possibility of MYC binding a new Non E-box sequence, AACGTT, \textit{in vitro}. Electrophoretic Mobility-Shift Assays (EMSAs) suggest MYC binds the new site, but at a lower affinity. Furthermore, Bioinformatics analysis revealed over 4000 promoter regions of genes bound by MYC contained the new Non E-box Sequence. The majority of these genes are cell cycle regulatory genes. The weaker affinity could indicate that genes, containing the new site in their promoter region, may become active or more active once the cell becomes cancerous via the overexpression of MYC.

Anna Almario, Chemical Engineering  
Faculty Mentor: Dr. Charles Wyman, Chemical and Environmental Engineering  
Thanh Yen Nguyen, Bioengineering  
Exploring Fed-Batch Systems for the Simultaneous Saccharification and Fermentation (SSF) of CELF-Pretreated Corn Stover

Developing processes that generate energy from sustainable sources is a societal challenge, especially with increasing energy demands and depleting fossil resources. A viable alternative is converting polysaccharides within lignocellulosic biomass, a renewable feedstock in such forms as woods and grasses, into valuable biofuel ethanol. One approach is through a novel pretreatment technology called co-solvent enhanced lignocellulosic fractionation (CELF) followed by simultaneous saccharification and fermentation (SSF). The CELF pretreatment uses tetrahydrofuran to fractionate biomass into two phases in which lignin and hemicellulose are solubilized in the liquid phase and cellulose remains in the solid phase for further processing in SSF for ethanol production. The objective of this project is to explore different feeding strategies using CELF-pretreated corn stover for possible savings of enzymes, time or downstream distillation costs (by achieving higher ethanol titers) when compared to simple batch process. A starting reactor content of 8% glucan and 15 mg enzyme/g glucan will be fed with two additions of 8% glucan at two-day intervals, translating into overall glucan content of 24% and enzyme loading of 5 mg/g glucan. This fed-batch system overcomes the limitation of batch SSF wherein the maximum glucan load is 11%, previously shown to produce 57 g/L ethanol (91% yield) in 9 days with enzyme loading of 5 mg/g glucan. Through this experiment, effects of fed-batch strategy on ethanol titers, yields and fermentation times can be determined at overall enzyme loading of 5 mg/g glucan, providing insight on which strategy makes ethanol production from biomass feasible for industrial scale-up.
Ayymen Amaar, Chemistry
Faculty Mentor: Chia-en Chang, Chemistry
Modeling the Intermediate Transfer Step in the Gox/HRP Enzymatic Cascade On Molecular Scaffolds

Enzymes have the ability to increase chemical reaction rates. When multiple enzymes are combined in a cascade, they can sequentially synthesize chemical products. Engineering enzymes can replace traditional reactions that use harsh and toxic solvents which can cause environmental harm. It has been shown that immobilizing enzymes on a molecular scaffold increases enzymatic efficiency. The enzyme cascade of Glucose Oxidase (Gox) and Horseradish Peroxidase (HRP) is used as a model to understand how to make chain reactions in enzymes more efficient by modeling the intermediate transfer step. In the Gox/HRP system, H2O2 (Hydrogen Peroxide) is the intermediate in this step, and understanding what optimizes this step gives us insight into engineering enzymes with high product yield. Therefore, we became interested in how the probability of substrate transfer (H2O2) in the Gox/HRP system was affected when attached to a DNA origami tile and DNA nanotube. I varied the scaffold affinity in the origami and nanotube, and the length and radius of the nanotube. A computational methods, coarse grained Brownian dynamics, was employed to answer these questions and model our system. Software written by the Chang Group was used to simulate the diffusion of 2000 substrates in each simulation. Preliminary results reveal that in both the origami tile and nanotube simulations, increasing scaffold affinity decreased substrate transfer. Increasing the affinity makes the system sticky, causing the substrates to move slower. In the nanotube simulations, decreasing the length of the nanotube also decreased substrate transfer, while decreasing the radius increased substrate transfer.

Jennifer An, Chemistry
Faculty Mentor: Catharine Larson, Chemistry
Synthesis of 2-Alkyl-Quinolines for Anti-cancer Testing

Quinolines are nitrogen-containing aromatic compounds found in an array of drug therapies, dyes, pesticides, organic light-emitting diodes (LEDs), and ligands for catalysis. The Larsen Lab has developed a green method to synthesize quinolines bearing alkyl groups in a single step from inexpensive commercially available starting materials. Expanding the structures that are rapidly accessible increases the probability of finding a compound with the ability to suppress tumor growth by killing cancer cells more selectively than healthy cells for reduced side effects. Compared to larger alkyl-substituted polycyclic heteroaromatics that require multistep syntheses, bicyclic 2-alkyl quinolines retain micromolar anti-cancer activity in vitro against cisplatin-resistant cell lines. Heating a copper catalyst with a combination of anilines, alkyl aldehydes, and phenylacetylene produces a range of 2-alkyl-quinolines. In addition to synthesis and purification, these new compounds are fully characterized using spectroscopic methods. In vitro testing of these new target quinolines against lung cancer cell line A549 and glioma cell line GL26 is underway.
Noah R. Angel, Chemistry
Faculty Mentor: Jack F. Eichler, Chemistry
The Synthesis and Biological Testing of Cupric Phenanthroline Complexes: An Alternative to Cisplatin?

The addition of transition metal centers to organic compounds facilitates interesting changes in the qualities of the original organic drugs, leading to the preparation of compounds known as metallotherapies. *Cis*-diamminedichloroplatinum (II) (cisplatin) is one example of such compounds used as a chemotherapeutic agent for cancer patients. It has been found in our laboratory that the parent organic ligands often have more enhanced anti-cancer activity than the corresponding gold (III) complexes. To determine if the organic ligands are the sole source of anti-tumor efficacy, new copper (II) complexes have been made to test if changing the metal center has an impact on the anti-cancer activity. Four new complexes have been made and characterized thus far: 2-sec-butyl-1,10-phenanthroline-dichloro copper (II) \(\text{[mono-sec-butylphen) CuCl}_2\) \}, 2,9-di-sec-butyl-1,10-phenanthroline dichloro-copper (II) \(\text{[di-sec-butylphen) CuCl}_2\) \}, 2-n-butyl-1,10-phenanthroline dichloro copper (II) \(\text{[mono-n-butylphen) CuCl}_2\) \}, and 2,9-di-n-butyl-1,10-phenanthroline-dichloro copper (II) \(\text{[di-n-butylphen) CuCl}_2\) \}. These complexes have been characterized via elemental analysis, ultraviolet-visible spectroscopy, X-ray crystallography, and mass spectrometry. Preliminary results indicate that di-substituted phenanthroline ligands yield orange-red dimeric complexes, while mono-substituted phenanthroline ligands yield the expected green-yellow monomeric complexes. X-ray crystallographic studies indicate that the geometries of the complexes are distorted square pyramidal for the dimerized species and distorted tetrahedral for the monomeric species. *In-vitro* SRB assays indicate these cupric compounds are more potent inhibitors of lung tumor cell growth than our previously reported gold(III) complexes. The mass spectrometry data indicate that each complex equilibrates between the monomeric and dimeric forms in solution, therefore future studies will aim to provide a more detailed understanding of this structural interconversion.

Jessica Arguelles, Bioengineering
Faculty Mentor: R. J. Hooley, Chemistry
Y.-J. Ghang, Organic Chemistry
Drug Delivery into Cells by Selective Cavitand-Mediated Endocytosis

One facet in the development of more effective drug therapies is the need for rapid and controlled transmembrane transport. A delivery system that is capable of selective recognition and transport of small drug molecules across cell membranes can provide this. Receptor-mediated endocytosis (RME), is the most efficient natural system for the transportation of small molecules, such as drug candidates. Thus, an artificial delivery system that imitates RME will be an effective drug delivery strategy. Our system utilizes a fully synthetic, shape-selective cavitand as a host molecule to transport compounds into cells. This cavitand self-incorporates into membrane bilayers and promotes the transport of selective guests by endocytosis. Only guests containing a trimethylammonium binding handle (-NMe\(_3^+\)) can bind to the host due to size and shape complementarity. The system can be exploited to test the hypothesis that it can be used as an efficient method for cancer drug delivery. The first step in doing so is to synthesize a cytotoxic drug derivative containing a suitable trimethylammonium binding handle. Chlorambucil was chosen as the best candidate and was coupled with dimethylethlenediamine, followed by methylation to introduce the binding handle. Lastly, the drug derivative was characterized by Nuclear Magnetic Resonance Spectroscopy (NMR). The next vital step is to incubate cells with the drug derivative and cavitand. Sulforhodamine B (SRB) assays will be used to determine the cytotoxicity of the drug candidate in the presence and absence of cavitand transporter, which will confirm whether the drug can be transported into the cells by our delivery system.
Ryan Assali, Biology  
Faculty Mentor: Dr. Sean R. Cutler, Department of Botany and Plant Sciences  
Inge Verstraeten, Botany and Plant Sciences  
Generating START-protein overexpression Arabidopsis thaliana lines

START-proteins are a large family of ligand binding proteins present in organisms across the biological kingdoms. Studying the role of these proteins in different biological processes via removal of single genes in knockout mutants is challenging for this family because of functional redundancy. Instead, individual START-protein overexpressing lines are generated to study the phenotype and hence acquire clues about the function of the overexpressed gene. The overexpression lines were generated by floral dip technique. Previously made constructs in which the protein coding regions of individual START-proteins, under control of a constitutive plant promoter (35S) and fused to an HPB-tag that allows affinity purification were transferred into the plants using Agrobacterium-mediated transformation. In the plants, this engineered T-DNA was integrated in the genome so that upon transcription the plants overproduced the proteins of interest. Following the floral dip, progeny was tested to identify transformants, which were selected using the co-transformed BASTA resistance gene. Subsequently, expression was evaluated in the T1-transformants via Western blot analysis. T2 seeds were screened to select single copy insertion lines and currently homozygous T3 plants are propagated to end up with sufficient seeds of single insert, highly expressing, homozygous overexpression lines. These lines can then be used to study the function of the START-proteins via a study of the phenotypes of the transformants and they will thus help us to understand the physiological function of START-proteins as well as make agricultural advances in regard to dealing with drought.

Niusha Bavadian, Neuroscience  
Faculty Mentor: Edward Korzus, Psychology  
Prefrontal Circuitry Supports Fear Memory Accuracy and Generalization

The purpose of this study is to examine the role of the prefrontal cortex in fear memory accuracy and generalization. The ability to discriminate between aversive and non-aversive stimuli underlies fear memory accuracy, while the inability to discriminate between two opposing stimuli is understood as generalization. Individuals with posttraumatic stress disorder (PTSD) tend to display overgeneralized fear memories. However, the neural mechanisms underlying the acquisition of fear memory specificity for discriminative responses of fearful and safe stimuli are obscure. To understand the circuitry of fear memory accuracy, the prefrontal cortex was examined to determine its role in distinguishing between aversive and safe stimuli. We employed an auditory discrimination task, which tests the ability of subjects to recognize the direction of frequency modulated (FM)-sweeps (trains of upward and downward FM-sweeps). We have demonstrated that that improvement of fear memory accuracy involves prefrontal cortex-dependent suppression of fear responses to safe stimuli. By examining neuronal activities at a population level, we are evaluating patterns of prefrontal neuron ensembles activated by aversive and safe stimuli before and after training on discriminatory fear learning. We anticipate that selection of distinct populations of prefrontal neurons in response to inputs is a mechanism for discriminatory fear learning.
Sandra B. Galeas, Spanish Linguistics  
**Faculty Mentor: Dr. Covadonga Lamar Prieto, Hispanic Studies**  
Elite California Women in the Nineteenth Century: Recuperating Their Agency In Alta California History

During the nineteenth century, the Mexican society of the Californios in Alta California went through major economic, political, social, and linguistic changes. The arrival of foreign merchants and capitalists after Mexico’s independence from Spain was the transition from a pastoral economy to a capitalist one. As society in California began to transition into its new country, Mexican Californios and Californias were subjected critiques. Foreign ideologies and stereotypes by foreigners given in respect to California women created a false chaste identity that continues to dominate the image of the past elite California woman today. The agency and voice of women, in particular elite California women, is denied in the writings of popular historians and by the Californios themselves. In this work, I will analyze which women constitute the elite class in Californio society and discuss how these stereotypes distinguished between an imagined elite Spanish woman and a Mexican woman. Juxtapositioning these stereotypes, we can see how this grew to become a part of an already complex political agenda by foreign merchants to dominate the newly acquired area. I argue that in their attempt to rescue the virtue of California women, Californio men aided in complicating these false identities. I attempt to give agency to these women by analyzing their filtered voices in the few testimonios available and working with personal correspondences and documents by elite California women to discuss their roles in the emergence of bilingualism in the late nineteenth century.

Lisa Bishop, Chemistry  
**Faculty Mentor: Prof. Catharine Larsen, Chemistry**  
Increasing 2-(2'-pyridyl) quinoline Reaction Yields to Facilitate gold(III) Catalysis

The Larsen chemistry group focuses on accessing small nitrogen-containing molecules by catalyzing one-step multicomponent reactions from inexpensive starting materials. To this end, we have published a solvent- and metal-free synthesis of substituted 2-(2'-pyridyl)quinolines using an aniline, an aldehyde, and an alkyne using triflic acid as the catalyst. The research proposed herein is to provide an improved method for these heteroaromatic compounds using metal salts. This project begins by screening new metal triflate catalysts, varying the temperature, reaction times, and solvents, and including any other additives, such as drying agents or an inert atmosphere, in order to increase reaction yields. The ability to form larger amounts of these bidentate ligands will facilitate the study of their ability to affect gold(III) catalysis as well as anticancer and antimalarial testing of both the free ligands and their gold(III) complexes. By tracking the effects of how electron-rich to electron-poor substituents on the ligand scaffold changes, the stability and reactivity of gold(III) centers will contribute to the optimization of gold(III) catalysis.
Victor Camberos, Biology,  
Faculty Mentor: Dr. Prue Talbot, Department of Cell Biology and Neuroscience  
Rachel Z. Behar, Cell Molecular and Developmental Biology  
Formaldehyde Detection in Electronic Cigarette Aerosols.

Electronic cigarettes (EC) are quickly gaining popularity due to their claims of being safe smoking alternatives. EC users replenish their devices with refill fluids, which are composed of flavorings, nicotine, and a humectant. Recently, there has been an increased concern about the contents of EC aerosols, since various chemicals and particulates have been identified such as formaldehyde, a known carcinogen. The focus of this study is to detect levels of formaldehyde in aerosols produced from six refill fluids as well as three commonly used humectants. Aerosols were produced and collected using a refillable EC and a smoking machine. Each aerosol was evaluated using a CHEMetrics formaldehyde test kit, which detects between the ranges of 0-12,000ppm (0-0.4M). Previously, cytotoxicity data were obtained for these refill fluids, which were screened on human pulmonary fibroblasts directly in fluid form and in aerosol form. The data obtained in this project was also used to compare back to cytotoxicity from these previous studies. The aerosol samples ranged in formaldehyde concentration, suggesting that particular flavors or humectants may lead to higher exposures to harmful chemicals. These data will help determine which EC products pose a potential health hazard and contribute to the foundation of science upon which regulation can be built.

Valita M. Chailert, Psychology and Albert L. Ly, Psychology  
Faculty Mentor: Dr. Rebekah Richert. Psychology  
God Comforts Me: Parents’ and Children’s Views of God’s Emotional Properties

Adults characterize God as an observer and enforcer of prosocial behaviors (Norenzayan et al., 2014; Shariff & Norenzayan, 2011). Additionally, parents transmit their religious views to their children (Hoge, Petrillo, & Smith, 1982). The current study had two aims: (a) to explore whether parents and children view their personal, emotional relationship with God as punishing and/or supportive; and (b) to examine if children and parents view God similarly. In this study, 164 children were interviewed while their parents filled out a survey. Children ranged in age from 3.52 to 6.46 ($M = 4.71, SD = .73, 60\%$ female). Participants indicated if they believed that God is loving, comforting, punishing, gets angry, or scares them. For example, children and parents were asked, “Does God comfort you when you are sad?” Participant answers ranged from “no” (-1) to “yes” (+1). The means, standard deviations, and paired samples t-test statistics are listed in Table 1. Analyses indicated children and their parents generally viewed their personal, emotional relationship with God as positive, characterizing God as loving and comforting. Participants were less certain about whether or not God gets angry when they do something bad, and did not characterize God as punishing or scary. The paired samples t-tests revealed that parents and children significantly differed on two questions: God as comforting and God as punishing. Despite these differences, on average, parents and children both stated that God comforts them when they are sad and that God does not punish them.
Justin Chung, Chemistry  
**Faculty Mentor: Ludwig Bartels, Chemistry**  
*Synthesis and Characterization of Monolayer MoS2 on Graphene and Different Substrates*

This work presents the growth of molybdenum disulfide (MoS2), a 2-dimensional transition metal dichalcogenide. Our growth of this material via chemical vapor deposition (CVD) permits us to achieve a single monolayer of MoS2. At this monolayer thickness, 0.6 nm, a single sheet of MoS2 exhibits new direct band gap semiconducting properties. Previous work has established a high throughput synthesis route for single-crystal, triangular islands. Presented here are methods that increase the size of the microstructures and expand our growth methods onto a variety of different substrates. Specifically, we show the growth of MoS2 on graphene.

Allison Cid, Microbiology  
**Faculty Mentors: Dr. Eugene Nothnagel, Botany and Plant Sciences**  
**Dr. Martha Orozco-Cardenas (Director of Plant Transformation Research Center)**  
*Effect of 3-O-Methylation of Cell Wall Galactosyl Residues on Desiccation Tolerance of Leaves from Transgenic Tobacco Plants*

Bryophytes, such as the moss *Physcomitrella patens*, and some other relictual plants are more tolerant of desiccation stress than are the more derived angiosperms. Evidence in the literature suggests that cell wall properties are important to desiccation tolerance. This project tests the hypothesis that O-methylation of cell wall sugar residues can influence desiccation tolerance. In *Physcomitrella* cell wall, arabinogalactan proteins contain abundant 3-O-methyl rhamnosyl residues that are not found in angiosperms. Five *Physcomitrella* genes annotated as encoding methyltransferases were selected for this study and expressed in tobacco. No 3-O-methyl rhamnosyl residues were detected in arabinogalactan proteins from any of the five groups of transgenics. One group of transgenics exhibited increased incidence of wilty leaves, however, and further analysis showed that the cell walls of these plants contained 3-O-methyl galactosyl residues that were not present in the other four groups of transgenics or in wild-type tobacco. A polyethylene glycol desiccation stress was applied to leaf segments from the transgenic plants. The transgenics expressing the moss galactosyl-3-O-methyltransferase exhibited greater desiccation tolerance, as judged by less electrolyte leakage during rehydration after the desiccation stress, than did the other transgenics. Supported by a UCR Chancellor’s Research Fellowship and by USDA NIFA grant 2008-35318-04599.
James Colbath, Biology  
Faculty Mentor: Theodore Garland, Jr., Biology  
Are High-Activity Mice Resistant to Muscle Injuries?

Muscle injuries are common, especially among soldiers and athletes. Understanding individual differences in susceptibility to injury and ability to recover from injuries may allow us to shorten recovery times and lessen suffering. We studied two lines of mice that have been selectively bred (70 generations) for high amounts of voluntary wheel running (HR mice) and two non-selected control lines (C mice). We hypothesized that the HR mice would resist, or be better able to cope with, injuries to important locomotor muscles. Fifty male mice were injured by a weight drop on the right triceps surae muscles, and 50 more were left uninjured as a control. All mice were then given access to wheels. Wheel activity was measured each day during wheel access. Half of the mice were sacrificed at three days post-injury and the rest at six days post-injury, each having blood samples taken and triceps surae muscles removed for histological analyses. Results obtained to date indicate that HR and C lines have similar susceptibility to the effects of this type of injury. During the 6 days of wheel access, injured mice ran both slower and for less time per night than non-injured mice, regardless of being from selected HR lines or C lines. HR mice ran significantly more than C mice regardless of treatment, which could make them a good model for future research on how exercise affects recovery from injury.

Christopher Conner, Biological Sciences  
Faculty Mentor: Karine Le Roch, Cell Biology and Neuroscience  
Gayani Batugedara and Jacques Prudhomme, Cell Biology and Neuroscience  
The Role of the Autophagy Pathway in Histone Turnover in the Human Malaria Parasite

*Plasmodium falciparum*, the causative agent of the most virulent form of malaria, is responsible for approximately 627,000 deaths each year. The malaria life cycle involves asexual stages, composed of ring, trophozoite, and schizont, in which it invades the human host’s red blood cells – the symptomatic phase of the disease. Across these asexual stages, the malaria parasite undergoes dramatic chromatin remodeling. Specifically, histone protein depletion is observed at the trophozoite stage of the parasite – 18 hour post invasion. Here we attempt to investigate the role autophagy plays in histone depletion and chromatin remodeling. Autophagy means “self-eating” and involves an autophagosome vesicle that encapsulates cytoplasmic material to ultimately fuse with a lysosome for degradation. Not much is known about autophagy in the parasite and if it plays a critical role in histone turnover. To observe the effect of autophagy on histone level, we first treated the parasite with bafilomyocin, a drug that blocks the fusion of autophagosomes and lysosomes. We then performed immunofluorescence assays on treated and untreated parasite cultures to detect possible change of histone level as well as co-localization of histones with atg8, a protein required for formation of autophagosomal membranes. Bafilomyocin treated parasites display an increased level of histone proteins in the parasite nucleus at the trophozoite stage. This result suggests that the autophagy pathway is involved in histone degradation and turnover in the human malaria parasite.
Iván Armando Copado, Creative Writing
Faculty Mentor: Professor Michael Jayme, Creative Writing
Márquez’s cosecha: Stories of Guanajuato

Through a collection of five interconnected short stories, I will elaborate on the generational shifts within a family, la familia Marquez. Each story will provide the reader with insights into different transitional periods, examining the dynamic changes brought upon by marriage, economic instability, and the continuance of a family’s lineage. My stories are developed from oral histories shared within my family, la familia Copado, as well as narrations told in the town of Cutaro, Guanajuato. To respect the orators whose stories have inspired these tales, I have fictionalized each account, allowing each story to dictate how it must flow. Although the collection will follow one family, I hope that each reader will begin to understand the role of family in decision-making. The various work of authors such as Junot Díaz and Flannery O’Connor have helped to craft my investigation of human nature and its effect on familial bonds. Through their writings, each author presents flawed human traits to their readers—pride, envy, jealousy, and lust. This crafts realistic characters that force the readers to view all choices as more than good, bad, or influenced by the structures of a culture, but rather necessary. Through mentorship by noted author and scholar, Professor Michael Jayme, I hope to mirror the effect of their work. My stories will be refined, creating a collection about the struggles of one Mexican family, yet making each narrative resonate with any person whose flaws and choices have affected their family.

Iliana Cordova,
Faculty Mentor: Prue Talbot, Cell Biology & Neuroscience
Barbara Davis, Cell, Molecular and Developmental Biology and Esther Omaiye
Cross-Continental Comparison of Nicotine Labeling Accuracy in Electronic Cigarette Refill Fluids

Electronic cigarettes (EC) are nicotine delivery devices that contain humectants, flavorings, and often contain a concentration of nicotine that varies from 0-36mg/ml. These refill fluids often have mislabeled nicotine concentrations or have little to no information on ingredients. As EC usage is quickly gaining global popularity, of greatest concern is that refill fluids in different parts of the world may also be mislabeled and could lead to unintended nicotine addiction or illness/death in users or children. In this study, high performance liquid chromatography (HPLC) was utilized to identify and determine the accuracy of nicotine labeling in 14 refill fluids from the United States, Great Britain, and Nigeria. HPLC analysis was performed using a Hewlett Packard Series 1100 HPLC, a Thermo Scientific Hypersil ODS C18, 200mm x 4.6mm, 5 μm column with a flow rate of 0.8 mL/min. The injection volume was 5 μL. Each sample, with the exception of cinnamaldehyde containing refill fluids, Cherry Bomb and Sweet Cinnamon, was run five times and an average of the five runs was taken and the standard deviation was calculated. Generally, all refill fluids from all countries varied significantly from the labeled concentration. All refill fluids labeled as containing nicotine were found to contain less nicotine than what was indicated on the label. No nicotine was detected in refill fluids labeled as zero nicotine from the United States and Great Britain. However, nicotine was detected in the Nigerian zero nicotine products in concentrations ranging from 4.99-20.13mg/ml. These data supports the need for regulation of these products on a global scale by institutions such as the FDA and their regulatory counterparts in all countries worldwide.
Itzel Cortés, Spanish-Linguistics  
Faculty Mentor: Covadonga Lamar Prieto, Hispanic Studies  
The Genocide of the California Native Americans in 1846-1870 as supported by the 1948 UN Genocide Convention

History lacks the proper inclusion of the white\textsuperscript{1} intent to commit genocide against the California Native Americans during 1848-1870. The main argument given for such exclusion is that the decrease of the Native American population was mostly due to disease. There is no denying this, but what also needs to be recognized is that whites created conditions, which facilitated the contraction of such diseases. There were also other atrocities committed against the Native Americans, such as head scalping for monetary compensation and the destruction of their resources, among other things. The UN Genocide Convention in 1948 can justify these acts as an attempt to commit genocide. The convention determined that for genocide to occur there has to be a direct intent to destroy a group by causing bodily or mental harm, the infliction of conditions to bring about the destruction of the group, the prevention of births, and the transfer of children from one group to another. It also states that committing, attempting, inciting and/or the complicity in genocide deems a group guilty of genocide. The whites committed these acts because they saw the Native Americans as inferior and as an obstacle for the progression of society. So in the case of the Native Americans, the whites in California are guilty of genocide. We need to acknowledge the sufferings of the Native American people, because otherwise, to forget their suffering means that were are only continuing their extermination.\textsuperscript{2}

\textsuperscript{1}The term “white” or “whites” is used as a historical term.

Allen Justine S. Dalisay\textsuperscript{1}, Bioengineering  
Faculty Mentor: Emma Wilson, Biomedical Sciences  
Kathryn E. McGovern\textsuperscript{2}, J. Philip Nance\textsuperscript{3}, Clement David\textsuperscript{4}, Danielle Worth\textsuperscript{5}, Shahani Noor\textsuperscript{6}  
\textsuperscript{1}Department of Bioengineering, \textsuperscript{2}Biochemistry and Molecular Biology Graduate Program, \textsuperscript{3}Cell, Molecular and Developmental Biology Graduate Program, \textsuperscript{4}Neuroscience Graduate Program, \textsuperscript{5}Microbiology Graduate Program, \textsuperscript{6}Division of Biomedical Sciences, School of Medicine  
Study of "Secreted Protein, Acidic, Rich in Cysteine" (SPARC) During Inflammatory Immune Response to Toxoplasma

Toxoplasma gondii is a protozoan parasite capable of infecting nearly all warm-blooded animals, is one the most successful parasite - infecting about one-third of the human population - and can cause damaging brain diseases in immunodeficient peoples such as Toxoencephalitis. A continuous infiltration of T cells into the brain is required to control infection. The mechanisms required for efficient T cell migration within the brain during Toxoplasma infection are unknown. Here we investigate the function of "secreted protein, acidic, rich in cysteine" (SPARC) and its role in facilitating immune responses in the infected brain. Studies of ours have shown that T cells migrate on a fibrous network in the brain generated during inflammation in the CNS. This network can be visualized using two-photon microscopy. SPARC is a matricellular protein secreted by numerous cells in the body, including astrocytes, which is associated with extracellular matrix remodeling and migration of cells. This project hypothesizes that because of the role SPARC has in ECM remodeling, SPARC may be critical for fighting CNS infection in numerous ways including ECM remodeling, facilitating T cell migration, or facilitating CCL21, an important chemokine in T cell migration to the brain during infection, availability to the brain. Using mice that are deficient in the production of SPARC (SPARC/-/-), we demonstrate that SPARC is required to maintain a population of CD8+ T cells in the infected brain. In addition we will examine the relationship between SPARC and chemokine expression in the brain.
Heather David, Microbiology Major,
Faculty Mentor: Kurt E. Anderson, Ph. D., Department of Biology,
Ashkaan Fahimipour, Department of Biology
Effects of Primary Productivity on the Dynamics of Spatially Assembled Communities with Omnivory

The structure of ecological systems is heavily influenced by spatial flows of colonists (i.e., colonization) from outside systems. Whether variation in a community’s primary productivity alters the effects of colonization remain unclear. Studies of specialized consumers in three level food webs show marked biomass increase with increased nutrient enrichment. However, in systems with omnivory, predators may interrupt the food chain by directly consuming basal resources. Thus, the interaction between productivity and colonization rate remains unknown for systems characterized by omnivory. Here, we use an array of laboratory microcosms to test the hypothesis that the effects of colonization on the structure and dynamics of communities characterized by omnivory are influenced by productivity manipulation. Replicate microcosms containing protists; Blepharisma sp. (omnivore), Chilomonas sp. (intermediate consumer), and mixed bacteria; Serratia marcescens, Bacillus cereus and Bacillus subtilis; were established in 150 mL bottles (“mainlands”), which supply small 30 mL “islands” of varying productivity levels with colonists. Productivity (bacteria) is manipulated by altering nutrient concentrations in the “islands” which affects enrichment and maximum density. Fresh individuals are dispersed to the “islands” three times a week in amounts which simulate proximate and isolated spatial locations. We have seen great variability in population dynamics with Blepharisma sp. and less variability with Chilomonas sp. thus far. We will be applying mathematical models to explain these observations in greater detail. This study will inform ecological theory by demonstrating interactions between broad scale spatial processes, and local resource conditions.

Nicole De Silva, History and Business Administration
Faculty Mentor: Dr. Catherine Gudis, History
“A Princely Expenditure of Time”: Riverside Polo and Lawn Tennis as Conspicuous Leisure

My historical research examines the complex social and financial roles that local citrus growers played in the establishment of the Riverside Polo Club (1891) and the Casa Blanca Tennis Team (1883). I suggest that these clubs were used to cultivate an idealized agrarian society as a means of encouraging outside investment. At the same time, I argue that the story of these sport teams reveals the social ties and changing domestic lives of the city’s late 19th century inhabitants. To personalize these phenomena, I follow and discuss the athletic career of Robert Bettner, the man widely regarded as the “father of Polo in Southern California.” I also examine the experiences of his daughter, the female polo and tennis player Dorothy Bettner. My work draws upon a variety of primary sources, including newspapers, meeting minutes, personal notes, photographs, and artifacts; I use a visual culture approach by casting these objects and images as props in a larger cultural production. In addition, I examine Veblen’s notion of “conspicuous leisure,” explore the social nature of Riverside agribusiness culture, discuss the emergence of the “companionate family” ideal, and suggest complex spatial relationships between Riverside’s citrus-growing valley and its downtown business district. This thesis was inspired by my time spent organizing and cataloging an extensive collection of Robert Bettner’s personal polo trophies, many of which can be seen on display on the upstairs landing of the Riverside Heritage House Museum, the former home of Robert’s mother, Mrs. Catherine Bettner.
Alexis Dennis, English
Faculty Mentor: Dr. John Ganim, English
The Repurposing of Childhood Memory in the Creation of Identity in Sylvia Plath’s Fictive and Non-Fictive Literature

Sylvia Plath, one of the most notable writers of the twentieth century, is often discussed in comparison with other contemporary writers who prompted the literary movement that concerned itself with the exploration of the self through confessional writing. Plath’s fragmented notions of self that emerge as a result of her personal contentions with the larger social milieu of the twentieth century are apparent in her works, as she attempts to create her identity as a woman author in an androcentric culture. Plath’s desire to provide her reader with fictive characters bricolaged with fragmented and doctored childhood memories reflect her own attempts to bricolage her identity, suggesting the importance for the contemporary and modern writer to utilize writing as a means of creating identity through self-expression. Plath not only attempts to create her identity as a woman author in an androcentric culture through her fictive writings that are inspired by her personal experiences, but she utilizes her writings to explore multiple facets of the individual identity, including social identity, familial identity as linked to the domestic space, national identity, and her sexual identity as a woman author. This paper seeks to demonstrate and discuss how Plath bricolages and repurposes her previously repressed childhood memories within the fictive space to provide commentary on each of these four facets of individual identity, and ultimately to challenge the notion of the larger collective bricolage.

Stephen Doran, Psychology
Faculty Mentor: Dr. Will Dunlop, Social/Personality Psychology
Graduate Student: Erica Baranski, Psychology
Contradicting Personality Change Variables

Previous work in the applied areas of psychology is concerned with minimizing the gap between an individual’s actual and ideal selves. In this vein, motivational interviews (Rollnick, Miller, & Butler, 2008), personality coaching (Martin, Oades, & Caputi, 2014), and emotionality seminars (Nelis et al., 2011) have been developed to increase patients’ well-being and general mental health. Themes of importance, desire, and responsibility are consistent with each of these therapeutic approaches. The present study investigates the salience of these themes in a non-therapeutic population. 602 participants, recruited from Amazon’s m-turk were asked if they were currently intending to change an aspect of their personality, and if they were, they completed a questionnaire assessing specific aspects of their change goal as well as an open-ended question assessing what strategies they were using. From the aforementioned literature, we formed a composite of 'therapeutic approaches to personal change', which included their change goal’s importance, desirability as well as how responsible they felt towards the change. We did not find a significant relationship between our therapeutic composite and use of behavioral or cognitive strategies to change (r = -.05, p = .40 and r = -.02, p = .72, respectively). The participant’s perceived satisfaction of their personality change endeavor was similarly unrelated to therapeutic approaches to successful change (r = .08, p = .18). Results indicate that approaches successful in inciting change in a therapeutic setting are not relied on when people are left to their own devises. Further research should investigate conceptions that aid in the success of personality change endeavors among non-therapeutic populations.
Sarah Doyle, Media and Cultural Studies  
**Faculty Mentor: Lan Duong, Media and Cultural Studies**  
*Within the Hegemonic Paradigm: The Non-Dominant Narratives and Representation of LGBTQ Communities of Color in the 21st Century Digital Public Sphere*

Looking at sites of resistance within a hegemonic media such as the Internet and social media, this thesis paper examines the potential for resistance among minority groups in making a space for their voices on social media platforms and the larger digital sphere. These media platforms are controlled by hegemonic powers and systematically reflect dominant ideological discourses and representation. Because mainstream media co-opts transgender and queer sub-culture by emphasizing a cis-gender heteronormative culture, I will examine the downfall of Transgender and Queer communities of color who try to assert their voice in mainstream media. An example of this problematic is the important figure of Laverne Cox, a black transgender activist and actress who nonetheless prescribes to a heteronormative presentation, particularly because she underscores the performance of “femininity” in her transgender identity. In relation to Cox, I query whether or not mainstream media would be as receptive to her presence if her sexual orientation or gender performativity were more ambiguous? Part of my analysis of Cox’s persona will be grounded in my observations of her public persona. As a counterpoint to Cox’s singular transgender voice, I explore the significance of the blog, “Black Girl Dangerous.” This blog is important in the ways that it foregrounds the multiple subjectivities of the LGBTQ community, with an emphasis on people of color subjectivities. It operates to critique hegemonic power structures by highlighting writers who discuss the issues of race, sex, class, gender, nationality, sexuality, and disability within a white, patriarchal and capitalistic society via an intersectional mode of analysis. Studying Cox and “Black Girl Dangerous” in tandem, I will explore the limitations of non-dominant representations of minority groups within the larger frames of corporate media. I question how much the cultural discourse around transgenderism can truly shift within hegemonic paradigms.

Sarah Doyle, Media and Cultural Studies  
**Faculty Mentor: Yolanda Moses, Anthropology**  
*“Living the Promise” at UCR, Institutional Discourse within the Media, the University, and Public: The Praxis of Erasure within the Intersectionality of Identity*

In this article the discursive formations of diversity will be textually analyzed by doing a literature review of academic work written on the subject matter of diversity in higher education. The article then will analyze the university-produced media, campus tours, articles produced by outside media sources, U.C produced promotional video from 1969, and UCR historical timeline. After textually analyzing the various discursive platforms diversity in high education is discussed, the article will look at the erasure of intersectionality of identity of race, class, gender, ethnicity, religion, sexuality, and etc. in public diversity discourses, as well as analyze the select narrative the University provides that works to erase the impact of the life and work of Chancellor Tomas Rivera on the University of California Riverside campus. A set of recommendations will be made on the micro level for the University of California Riverside, as well as a wider problematizing of mainstream discourses of diversity in higher education.
Anh-Tho Duong, Bioengineering
Faculty Mentor: Dr. Jiayu Liao, Bioengineering
Graduate Students: Zhehao Xiong George Way, Raphael Kung, Xuejun Yu, Hilda Wiryawan

Determining the Mode of Action of a SUMOylation Inhibitor

SUMOylation is a post-translational modification in eukaryotes which involves the conjugation of small ubiquitin-like modifiers (SUMO) to protein substrates through an enzymatic cascade. Past work has indicated that this pathway is involved in various cellular processes and a small number of oncogenes such as PML, c-Jun, and c-Myb are regulated by SUMOylation, which correlates with the misregulation of the SUMOylation pathway found in carcinogenesis. Recently, our high-throughput screening assay on a library of over 200,000 compounds has found a small molecular compound, STE, which specifically inhibits the SUMOylation pathway. Further experiments have shown that the STE compound inhibits the formation of the thioester bond between E1 (Aos1/Uba2) and SUMO. To understand the molecular mechanism of SUMOylation inhibition by STE, site-directed mutagenesis on the Uba2 subunit of the E1 complex and measurement of the enzyme kinetics of the mutated E1 using real-time FRET assays were performed. In addition, Multiscale Thermophoresis will be utilized to further investigate the binding affinity of Uba2 mutants with STE. We expect that Uba2 with a mutated STE binding site will lose its sensitivity to STE inhibition, but will still maintain normal enzymatic function in the FRET assay. Specifically, we will introduce several site mutations – Y526A, N423A, V443A, and E157A to Uba2 to characterize the potential binding site of STE. The results obtained from this experiment will provide information about STE and its potential application in cancer treatment.

Vi-Khoi Duong, Cell, Molecular & Development
Faculty Mentor: Anupama Dahanukar, Entomology
Anindya Ganguly, Neuroscience

Deprivation of Sugar or Yeast Extract Causes Change in Behavioral Taste Preferences as a Result of Modulation of Neurons in the Peripheral Taste Organs

Sugars and amino acids are chief nutrients Drosophila melanogaster requires for survival. Flies use their gustatory system, primarily consisting of taste sensilla located on their legs (tarsi) and tip of proboscis (labellum), to scan their surroundings for these nutrients. Laboratory fly food consists of sugar (glucose) and yeast extract, which supplies free amino acids. We conducted a series of experiments to investigate if deprivation of a particular nutrient can orient the gustatory system so that the fly is better equipped to identify and consume that particular nutrient. We discovered that deprivation of either sugar or amino acids (yeast extract) enhances their behavioral preferences for sugar and yeast respectively. These shifts in behavioral preference have different dynamics. While sugar preference is enhanced within a day of sugar deprivation, at least four days of continuous yeast deprivation is required to observe enhanced preference for yeast extract. We also discovered that the behavioral changes can be traced to corresponding peripheral responses: deprivation of sugar enhances responses of peripheral taste neurons to sugar, whereas deprivation of yeast decreases them. This raises a very important question: how is the sensitivity of the taste neuron being modulated? In order to investigate the mechanisms underlying this modulation, we are sequencing transcriptomes from different taste tissues of the different nutrient-deprived flies as well as undeprived controls. A careful comparison would enable us to identify candidate genes that are differentially regulated upon nutrient deprivation and thus understand molecular mechanisms by which peripheral sensitivity is modulated to achieve nutrient balance.
Alejandro Echeverría, Anthropology and Spanish  
Faculty Mentor: Prof. Covadonga Lamar Prieto, Hispanic Studies  
Representations of Californios and Californian Indians: Perspectives of Social Dominance from 1790 to 1910

This paper examines the relation between Californian Hispanic society, of both Californian Indians and Californios, with the various representations created by United States visitors and explorers. I investigate the creation of the structural propaganda based in racial supremacy of the United States population above other groups in the region of Alta California from 1790 until 1910. I analyze the artistic works, drawings, photographs, and textual descriptions made by many individuals exploring the region during the time period. In addition, I focus on California law after state annexation to the United States and the legal treatment of both Californios and Californian Indians during the second half of the nineteenth century. I will, in this paper, reveal the racist mentality of United States population over the Californian Indians and Californios present in California. In doing so, I state the influence of visual and textual representations in historical social spaces as structural racism, that in effect, degraded Californian Hispanic society in California and allowed for the territorial and cultural dominance of the United States population over the region.

Colin Eckerle, Environmental Engineering  
Faculty Mentor: Dr. Kawai Tam, Chemical and Environmental Engineering  
Rice Husk, a Sustainable Building Material

In 2013 a magnitude 7.2 earthquake hit the island of Bohol, Philippines. This was followed a week later by the devastation caused by Typhoon Yolanda. Tens of thousands became homeless and were in need of shelter. The International Deaf Education Association (IDEA), a non-government organization (NGO) working in Bohol, stepped in to provide relief efforts by building homes to replace those that were destroyed. The relief homes were constructed primarily out of coconut wood and bamboo. These materials, while strong, were highly susceptible to termite infestations by the large population of termites in the Philippines and lasted a maximum of two years. The need to find a more durable material arose. To meet this need, IDEA reached out to Dr. Kawai Tam at the University of California, Riverside to form a senior design team to create a particleboard material made from rice husks to replace the bamboo and coconut wood materials. Rice husk possesses termite resistant qualities that make it the perfect choice as a replacement for wood and bamboo. Since June 2014, research has been conducted looking into developing rice husk particleboard. Research has been conducted into both the termite resistance of rice husks, as well as sustainable adhesives that can be used in the formation of the boards. Several prototypes have been produced and initial tests are promising. Funding for a bench top hot press was secured and optimization of the boards is currently taking place.
Catherine Elix, Biology, Neuroscience and Music  
**Faculty Mentor: Dr. Jack F. Eichler, Chemistry and Dr. Emma H. Wilson, Biomedical Sciences**  
Elma Frias, Biology, Neuroscience and Music  
**Investigating the Mechanism of Antitumor Activity for a Polypyridyl Drug Against Glioblastoma Tumors**

2,9-di-sec-butyl-1,10-phenanthroline (SBP) has been shown to induce antitumor activity in a variety of different head-neck and lung cancer cell lines, including the highly aggressive murine glioblastoma cell line, GL-26. Our laboratory has hypothesized that the polypyridyl chelating ligand SBP has a non-DNA target. Since Cisplatin is a DNA-targeting platinum-based drug, an experiment to determine if the combination of the polypyridyl ligand and Cisplatin significantly reduced the growth of GL-26 cells compared to individual treatments with SBP or Cisplatin was performed. The GL-26 cell line was cultured *in-vitro* and exposed to 0-25 µM Cisplatin, in combination with either 0.1 or 0.4 µM SBP for 48 hours. Sulforhodamine B (SRB) cytotoxicity assays were utilized to assess antitumor activity. The combination of Cisplatin and SBP at the chosen concentrations inhibited the growth of GL-26 cells in a dose dependent manner and increased antitumor activity compared to individual treatment of GL-26 cells with Cisplatin or SBP. Given the fact SBP sensitizes the GL-26 tumor cells to the Cisplatin treatment; this corroborates the hypothesis that SBP initiates tumor cell death via a mechanism that is unrelated to interactions with DNA. Since it is likely that SBP induces tumor cell death by apoptosis, the expression of two key proteins, caspase-9 and p53, involved in the apoptotic pathway were examined in the presence and absence of SBP via western blot analysis.

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Deanne Elliot, History/Political Science  
**Faculty Mentor Molly McGarry, History**  
**Women's Futurity at World's Fairs in the United States, 1876 to 1965**

World’s fairs are celebrations of the cultural, economic, and technological triumphs of the world’s nations in general and the host country in particular. However, world’s fairs, specifically those held in the United States from 1876 to 1965, can be problematic as they simultaneously embraced a kind of futurity and filtered it through conventional lenses defined by race, class, and gender assumptions of the time period that stratified participation and representation at the fairs. This research examines four world’s fairs held in the United States, focusing on depictions of women’s futurity in order to explore how and why fairs were arenas of public pedagogy in which such depictions were skillfully or unconsciously deployed. I will discuss how perceptions of future women, their futurity, was used at the exhibitions to reinforce political and social norms of a specific time, and simultaneously used by some women to subvert those norms. I will then track these changes across these four fairs. Drawing from the context of each, the fairs are examined as places in which education and technology each informed notions of female futurity. I draw from research and documents of key planning figures, particularly organizers of women’s areas; exhibits displayed by and for women; as well as images and exterior accounts of each fair. Strong emphasis is paid to newspaper accounts. This project seeks to discover how women’s futurity was depicted at the fairs and to what extent the fairs introduced or reinforced ideas of future womanhood that continue to impact women today.
Timothy Espiritu, Physics  
**Faculty Mentor: Chun Ning Lau, Physics and Astronomy**  
**Fabrication of 2D devices: Graphene and Phosphorene**  

Graphene has emerged as a promising 2D material because of its high thermal and electrical conductance. Our lab fabricates devices based on 2D materials such as graphene, MoS\(_2\) and phosphorene and characterize their performance such as bulk mobility, band gaps, and carrier density. One of our fabrication techniques is transferring, where we superimpose 2D materials onto each other. We mechanically exfoliate 2D materials onto SiO\(_2\) and use hexagonal boron nitride (hBN) for encapsulation. hBN provides an atomically smooth surface and is also a good insulator. Afterwards, electrodes will be attached to the device and transport measurements will be carried out. Among the materials studied, single layered graphene is a conductor with very high bulk mobility and lack of a band gap. Bilayer graphene has a band gap, but its mobility is not as high as a monolayer. 3 layered graphene has different stacking orders called Bernal (ABA) and rhombohedral (ABC). ABA does not have a band gap, but ABC has a small one. MoS\(_2\) is a 2D material with a band gap, but low mobility. The promising material that recently emerged is phosphorene which has both sizable band gap and high bulk mobility.

Myra Etuale, Biochemistry  
**Faculty Mentor: Dr. Jiayu Liao, Bioengineering**  
**Graduate students: Xuejun Yu, Dr. Hilda Wiryawan**  
**Characterizing the Potency of a Novel Inhibitor of the SUMOylation Pathway and its Derivative**

SUMOylation, one of the many important post-translational modifications in eukaryotes, is a process in which small ubiquitin-like modifiers (SUMO) are covalently attached to other protein substrates. The SUMOylation enzymatic cascade involves three enzymes: SUMO E1 activation enzyme (Aos1/Uba2), SUMO E2 conjugation enzyme (Ubc9), and SUMO E3 ligases. SUMOylation plays an important role in diverse cellular processes and misregulation of SUMOylation is related to human diseases such as neurodegenerative diseases and numerous forms of cancer. Thus, the SUMOylation pathway is a very promising target for cancer treatments. From our FRET-based high throughput screening for SUMOylation inhibitor discovery, the compound STE was found to inhibit SUMOylation and preferentially kill cancer cells. STE inhibits the E1~SUMO thioester bond formation with an IC\(_{50}\) = 1.21\(\mu\)M in a dose-dependent manner. To understand the molecular mechanism of SUMOylation inhibition by STE, the inhibition constant of STE and various STE derivatives will be measured using the Western blot assay and the Förster resonance energy transfer (FRET) technology. This result will facilitate drug discovery involving a SUMOylation inhibitor as a potential drug for cancer treatments and therapeutics.
Lucas Flores, Physics, Applied Math  
**Faculty Mentor: Dr. Richard Seto, Physics and Astronomy**  
Jet Studies on the MPC-EX pre-shower Detector Upgrade to the PHENIX Experiment  

The Muon Piston Calorimeter Extension (MPC-EX) is major new detector being added to the PHENIX experiment at the Relativistic Heavy Ion Collider (RHIC), a large particle accelerator, at Brookhaven National Laboratory in Long Island, NY. This device will allow for the study of the earliest stages in the formation of the Quark Gluon Plasma (QGP) – a state of matter in which quarks and gluons are free – by detecting particles from the energetic collisions of heavy nuclei. This new detector will allow for high-resolution images of the reaction, a resolution good enough to detect photons and streams of particles called “jets” produced during the first $10^{15}$ seconds of the reaction, where an extremely high density of gluons is thought to exist. The studies I am doing are done in a detailed simulation of the detector that takes into account all materials and geometries. I will be looking at how well we will be able to measure jets and photons with the MPC-EX to better elucidate our ability to make measurements of the behavior of gluons at very high density. Such studies are relevant to the design of novel and improved detection and imaging systems.

Sarah Folk, English  
**Faculty Mentor: Professor John Ganim, English**  
Linear and Cyclic Constructions of Time in *Sir Gawain and the Green Knight*  

In *Sir Gawain and the Green Knight*, the poet deals with the conflicting conceptions of time arising from the historical appropriation of subversive pagan Arthurian folklore and its integration into traditional nationalist Christian mythology. As Frank Kermode discusses in *The Sense of an Ending*, the linear, teleological construction of time espoused by proponents of Christian doctrine is one which gives meaning and purpose to men’s otherwise menial and inconsequential existences; it directly conflicts with the ancient perception of time as being cyclical, an understanding which originated with the predominantly agrarian societies utterly dependent on the seasons for their livelihood, the natural consequence of which was the worship of the pagan deities controlling those seasons. Sir Gawain, fastidious and ever concerned with his own perfection, is the poet’s representative of Christian ideals; his journey toward impending death is an allegory for teleological temporal structure. But symbols of cyclical time and the pagan heritage with which it is associated appear throughout the poem, especially in its resolution, questioning the supremacy of Christianity and the completeness of its adoption. The poet, himself almost certainly Christian, uses the conflicting representations of time within *Sir Gawain and the Green Knight* to demonstrate the flaws and oxymoronic paradox inherent to the integration of pagan legend into Christian mythology, suggesting that it is not nearly as seamless as might be intimated by society and contemporary chivalric discourse.
Mark Forde, Political Science/International Relations  
**Faculty Mentor: David Pion-Berlin, Political Science**  
**Triggering Uprisings and Regime Change through Political Assassinations**

This study examines the assassinations and executions of opposition leaders in the Philippines and Pakistan, to discover why the assassination of Senator Benigno Aquino lead to the removal of Philippine dictator Ferdinand Marcos, whereas the execution of Zulfiqar Ali Bhutto in Pakistan, did not. By examining the assassinations and executions of opposition leaders, the goal is understand how influential the death of an opposition leader is, and whether or not the assassination of an opposition leader can act as a trigger for successful regime change. This comparative case study focuses on the periods immediately before, and after successful assassinations and executions. Economic conditions, social movements, religious leadership involvement, dissatisfaction by elites, loss of foreign direct investment, social classes, military involvement, and external state influence are examined.

Bianca Freeman, Political Science, MEIS  
**Faculty Mentor: Dr. Bronwyn Leebaw, Political Science**  
**“The Truth, Justice, and Reconciliation Commission in Mali: A Comparative Approach to Analyzing the Role of Local Responsibility and Truth-telling”**

This research examines how the Truth, Justice, and Reconciliation Commission in Mali addresses truth in societies of transition that exhibit deep local conflict resolution practices and values. The goal of this study is to show that the effectiveness of the truth commission (TC) in Mali is impacted by the level of local by-in that it achieves. To develop this hypothesis, case studies on the Solomon Islands TC and the Sierra Leone TC will be conducted in order to understand the impacts of local responsibility and truth-telling on the ability of the TC to cultivate local by-in. These findings will reveal that local participation in the Solomon Islands and Sierra Leone lacked influence and depth, which limited confidence that the truth commission could substantively address truth about human rights abuses and atrocities committed by the state and other actors. This common theme that emerges from the comparative framework of these cases will be identified in the Mali context in order argue that deeper local integration and consultation practices must be achieved in order to encourage by-in from the population it aims to impact. This research calls attention to the importance of local participation in addressing issues of truth and finding potential paths to peace-building and reconciliation in post-conflict societies.
Elma Frias, Neuroscience and Music  
Faculty Mentors: Devin K. Binder, Biomedical Sciences; Todd A. Fiacco, Cell Biology & Neuroscience; Emma H. Wilson, Biomedical Sciences  
Clement N. David, Neuroscience; Jacqueline Hubbard, Biochemistry  
Investigating Morphological Changes of Astrocytes and their Role in the Influx of Leukocytes During Toxoplasma gondii Infection.

Toxoplasma gondii is a protozoan parasite which can infect any mammalian nucleated cell. This parasite infects 10-15% of Americans and up to 80% of people in parts of South America and Europe. Infection by T. gondii is characterized by the lifelong presence of parasitic cysts in the brain, requiring a competent immune system to prevent parasite reactivation and massive neuronal death. The signal that recruits leukocytes to the central nervous system (CNS) and maintains their activated state during chronic infection is not fully understood. A possible mechanism is that a constant source of parasitic antigen leaking from the CNS would provide the necessary activation and induce migration of peripheral T-cells to the brain. Astrocytes, the most numerous CNS cell type, specifically express AQP-4, a trans-membrane protein that facilitates bi-directional water transport. A study demonstrated that AQP-4 were required for clearance of debris from the CNS through conductive flow of water out of the brain and into the blood. This study investigates the mechanism underlying morphological changes of astrocytes and determines the extent of contribution of AQP-4 in maintaining a constant influx of leukocytes during infection. AQP-4 RNA and protein levels were measured during the course of infection and its expression was determined by immunohistochemistry. Antigen specific T-cells in the periphery and those recruited to the brain were measured by tetramer analysis and flow cytometry of infected wild-type and AQP4/- deficient mice. The importance of this study is to determine the mechanism underlying morphological changes of astrocytes and their role in the influx of leukocytes during chronic infection.

Stephanie Gamez, Biology  
Faculty Mentor: Dr. Bradley J. White, Entomology  
The Genetic Basis of Body Color Variation in the African Malaria Mosquito

Insect body coloration is an ecological adaptive trait that is often variable within and between species. Body coloration functions in mimicry, species recognition, camouflage and various physiological processes. In insects, body color variation often correlates with environmental and ecological factors such as aridity and heat. Despite the ubiquity and ecological significance of body color variation, little is known about the genetic basis of this trait. We investigated the genetic basis of natural pigmentation variation in the African malaria mosquito Anopheles gambiae. In order to elucidate the gene(s) responsible for abdomen color, we generated experimental crosses to produce recombinant hybrids that can be used for genetic mapping. We quantified and measured abdomen pigmentation and pattern in 576 individuals using digital photography. Each mosquito was genotyped at thousands of SNPs using high-throughput quantitative genetic analysis. Analysis of genetic data shows that gene(s) on the left arm of chromosome 2 have a major influence on the cuticle color phenotype. Currently, we are attempting to identify candidate pigmentation within this region for functional knockout.
Jesus Garcia, Biochemistry
Faculty Mentor: Valentine Vullev, Bioengineering
Single Molecule Force Mechanics of Protein Interactions

The study of mechanical properties of biological macromolecules is vital to field of proteomics. Through the use of magnetic tweezers we are able to manipulate single biomolecules by directly exerting force on them in order to understand their mechanical properties. Carbonic anhydrases are a family of enzymes that catalyze the interconversion of water and carbon dioxide to bicarbonate and protons. On glass slides, the processes of salinization, aldehyde de-protection, and the addition of functionalized polyethylene glycol layers allowed us to derivatize glass with polyethylene glycol (PEG) layers covalently functionalized with bovine carbonic anhydrase. In parallel, we coated superparamagnetic carboxylated beads with a similar polymer coating that contains a ligand, which allows us to study the interactions between molecules of interest. In the presence of a magnetic field the superparamagnetic beads become magnetized and allow us to precisely exert specific forces ranging for 100 fN to 100 pN in order to conduct our force experiments. While we are currently investigating the protein biomolecule pair, we expect to observe rare events that can only be observed with the stochastic nature of single-molecule level events.

Michael Garcia, Biology
Faculty Mentor: Iryna Ethell, Biomedical Sciences
Jordan Koeppen, Cell Molecular and Developmental Biology
Role of EphrinB1 Signaling in Astrocytes

An estimated 1.7 million Traumatic Brain Injury (TBI) related emergency visits, hospitalizations, and deaths are reported each year in the United States [1]. Astrocytes, the most abundant cells in the human brain, are actively involved in brain repair following traumatic injuries by protecting neurons against glutamate excitotoxicity, as well as rewiring neuronal networks [2]. However, the mechanisms that regulate astrocyte-mediated brain repair are yet to be established. Our previous studies suggest that interactions between EphB receptors and their ligand ephrin-B1 are involved in the astrocyte regulation of synapse remodeling following TBI [3, 4]. Beyond the influence of early cell patterning and axon guidance, EphB receptors and ephrins are also known to participate in synapse development in the brain. However, little is still known about their role in astrocytes and how it may influence synapse remodeling following TBI. We hypothesize that ephrinB1 signaling regulates astrocyte functions by regulating the activity of signal transducer and activator of transcription 3 (STAT3) [5]. To examine the effects of ephrinB1 activation on STAT3 signaling in astrocytes we performed western blot analysis. Primary astrocytes were treated with control Fc or EphB2-Fc to activate ephrinB1. The levels of phosphorylated STAT3 (active form) and total STAT3 were detected with anti-pSTAT3 and anti-STAT3 antibodies. Analysis shows upregulation of STAT3 activity following the activation of ephrinB1 in astrocytes. Additionally, ephrinB1 deletion from astrocytes affected mouse behaviors in the social preference (3-chamber) and anxiety (Open Field) tests. These studies provide new insights into the role of astrocytic ephrinB1 in synaptogenesis and social behaviors.
Jeffrey Geiger, Chemical Engineering  
**Faculty Mentor: Dr. David Kisailus, Chemical and Environmental Engineering**  
Ultrastructural and Chemical Analysis of Chiton Feeding Apparatus

The highly organized feeding mechanism of the *Cryptochiton stelleri,* more commonly known as the gumboot chiton, consists of two columns of teeth along a belt-like tongue called a radula, with each tooth attached to this radula by a stylus. There is much interest in the chiton tooth-stylus structure due to the abrasion-resistant nature of the tooth as well as the high degree of flexibility in the stylus to prevent delamination at the stylus-tooth interface. Most recent data collected provides insight into the mineralization process of this structure, presenting several possible mineral pathways within the stylus during mineralization. In addition, various imaging techniques, such as energy-dispersive x-ray spectroscopy, optical microscopy, and electron microscopy, allow us to characterize the stylus at various cross sections and view structure behavior under different types of stress. Studying this system has promising applications in heavy manufacturing, where heavyweight parts are costly and cause excess strain on the motors used by heavy machines. An overarching goal of this project is to gain an understanding that will soon allows us to create a synthetic bio-inspired stylus while still maintaining the advantageous characteristics, ultimately creating lightweight, cost-effective alternatives to heavy machine parts that are as strong and durable.

Haydi Gerges, Psychology  
**Faculty Mentor: Rebekah Richert, Psychology**  
Children's Understanding of and Adherence to Asthma Treatment

Lack of treatment adherence places a heavy financial burden on society, and this burden is even greater when considering children with chronic conditions like asthma. Previous research has found that children’s non-adherence to a doctor’s prescribed treatment comes from ignoring their role as the main contributor to the treatment plan and their parents’ beliefs about the treatment plan. Parents’ cultural beliefs and lack of communication with the physicians are additional reasons children do not take their prescribed medications. In this study, we interviewed 21 3- to 18-year-old children (4 Hispanic/Latino, 14 White/Caucasian, 1 Black/African American, 1 Indian/Southeast Asian, and 1 Pacific Islander). The mean age of children was around 11.05 years old. Interview questions asked children about their understanding of asthma and allergies to explore possible reasons children do or do not adhere to their treatment plans. Analyses will examine whether children’s awareness of their illness and treatment plan predicts children’s adherence to their treatment plan. The implications of this analysis can inform suggestions for doctors, parents, and schools in helping children cope in healthy ways with asthma. For example, school programs are important in educating children with chronic illness. These educational programs can help children manage their medication intake on their own, but also know what to do in case of emergencies. The findings from this study can inform school health professionals about effective ways of engaging children with asthma in their own treatment adherence.
Rojin Ghobadi, Biology  
**Faculty Mentors:** Eugene A. Nothnagel, Botany and Plant Sciences  
Martha Orozco-Cardenas, Director of Plant Transformation Research Center  
Bijan Sasaninia, Microbiology, Zachary Cryder, Saba Wube, Gabriel Juloya, Brooke Weston, Seung Seo, Jiha Lee, Adrian Padro  
Expression of a Moss Methyltransferase that Produces 3-O-Methyl-Galactosyl Residues in Transgenic Tobacco

World petroleum is limited and will be exhausted within decades at the current use rate. Controlling O-methylation of cell wall sugars might alter the efficiency of plant biomass conversion to biofuels, which motivated this study. A methyltransferase gene from the moss *Physcomitrella patens* was transgenically expressed in *Nicotiana tabacum*, where it caused synthesis of 3-O-methyl-galactose in alcohol-insoluble residue, a cell wall-enriched fraction. This methylated sugar occurs at relatively high levels in the walls of lycophytes but at low levels, or not at all, in other relictual or derived plants. 3-O-Methyl-galactosyl residues are not detected in wild-type tobacco. The primary goal of this project was to examine the levels of expression of 3-O-methyl-galactosyl residues in the various organs of transgenic tobacco. Because a constitutive promoter was used to drive the expression of the moss gene in tobacco, the hypothesis is that all four tobacco organs will contain 3-O-methyl-galactosyl residues. Alcohol insoluble residues were prepared from the organs of three different transgenic tobacco plants. Cleavage, derivatization, and gas chromatography-mass spectrometry of these preparations consistently showed that 3-O-methyl-galactosyl residues were present in all four organs with abundance increasing from stem to root to flower to leaf. Future research will aim to determine the localization of 3-O-methyl-galactosyl residues within the leaf cell wall. To this end, highly purified leaf walls will be prepared and sequentially extracted to obtain pectin, hemicellulose, and cellulose-rich fractions, which will then be analyzed for content of 3-O-methyl-galactosyl residues. Supported by UCR RISE Program and by USDA NIFA grant 2008-35318-04599.

Marissa Gionet-Gonzales, Bioengineering  
**Faculty Mentor:** Dr. Wenwan Zhong, Chemistry  
Fabrication of Silica Nanofibers for Nucleic Acid Extraction

DNA extraction is a vital technique in biology often used in the diagnosis of diseases, and DNA and RNA research. Commercially available silica coated iron oxide beads are able to extract as low as 1 fmol of DNA. However silica nanofibers should better extract DNA because of their larger surface area. Silica fibers are also cheaper to produce than the silica beads, making them more economical as well as extraction efficient. In this research, silica nanofibers 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. After electrospinning, the fibers were calcinated to remove solvents and PVA. These fibers were then used in DNA extraction from .5 mL of solution. After eluting the extracted DNA from the fibers and amplification by polymerase chain reaction (PCR), gel electrophoresis showed that the DNA from the HCl reacted 2:1 ratio silica fibers demonstrated a more distinctive band in the gel than the silica beads and other fibers at 2 pM (3.3 fmol). This indicates that these fibers recovered a higher concentration of DNA and proves that silica nanofibers are more efficient both extraction and cost wise. The use of silica fibers in DNA and RNA extraction can potentially increase detection of disease and lower the cost and time of biological and medical research that rely on extraction.
Cody A. Gonzalez, Mechanical Engineering  
Faculty Mentor: Sandeep Kumar, Mechanical Engineering  
*In Situ* TEM Observation of the Electrochemical Lithiation of Polysilicon Thin Films

One of the primary issues that restricts the development of new materials for next generation lithium ion batteries (LIB) is performance degradation over the lifecycle of the battery. Our goal is to elicit clear understanding of the mechanisms responsible for the degradation of performance that will help in designing better materials for the electrodes and improving the performance. The transmission electron microscope (TEM) is one of the premier tools to understand material behavior. We are developing an *in-situ* TEM LIB setup that would allow us to understand the material degradation during lithiation (charge) and delithiation (discharge). The primary material of the current study is Silicon since it has the maximum specific capacity of any anode for LIB’s. Through the use of photolithography, deposition, and etching techniques these devices are created and then tested via *In Situ* TEM. *Ex situ* experiments are currently being performed wherein a constant voltage will be applied across the device setup to observe the deformation mechanics of nanoscale Silicon. Preliminary results have yielded discoloration of the Polysilicon given prolonged exposure to Lithium and Ionic Liquid Electrolyte. Pending confirmation of successful lithiation through TEM observation of the lithiated Polysilicon, additional experiments will be conducted to determine the electrical and thermal properties of the lithiated Polysilicon. These additional experiments will provide the desired information about the deformation mechanics of Polysilicon as measurements can be taken after every cycle to determine how the properties of the material change as the Silicon becomes pulverized through the multiple cycles.

Elsie Gonzalez-Hurtado, Biochemistry  
Faculty Mentor: Ernest Martinez, Biochemistry  
Muyu Xu  
Elucidating the TBP-TATA binding dependency of the human β-actin gene promoter

Little evidence has been reported indicating that the core promoter DNA region affects the ability of activators to stimulate transcription. Our lab has found that the promoter proximal activating sequences located upstream of the β-actin (*ACTB*) gene core promoter only activate TATA-containing promoters, but not TATA-less Initiator-containing promoters. These data suggested that the TBP-TATA interaction might be critical for transcription activation by only selected activating sequences and associated activators. Additionally, because all transcription requires TBP—regardless of the presence or absence of a TATA-box—the role that TBP plays in various promoter contexts may differ. The aim of this study is to determine the importance of the TATA-binding activity of TBP for transcriptional activation by the TATA-dependent *ACTB* promoter. To accomplish this we used a human HeLa cell line that expresses both wild type TBP and a mutant TBP<sub>T210K</sub> that cannot bind to the TATA box; both are expressed to similar levels and associate with TBP associated factors (TAFs) to form stable TFIID complexes. An RNA interference approach was used to selectively knock down wild type TBP in these cells without affecting the expression of the mutant TBP<sub>T210K</sub>, and then measured the ability of the *ACTB* proximal promoter and other promoters to activate transcription of different reporter genes. Results indicate that the mutant TBP<sub>T210K</sub> cannot replace wild type TBP to support activation by the *ACTB* proximal promoter, but can support transcription from other promoters. Such results suggest that *ACTB* proximal activators (such as the serum response factor) are TATA-selective and require TBP binding to TATA in order to stimulate transcription, while other activators are independent of TBP binding to TATA.
Roberto Gutierrez, Biochemistry
Faculty Mentor: Margarita Curra-Collazo, Chemical and Environmental Engineering
Kurt Spurgin, Cell Biology and Neuroscience and Alex Prien
Developmental Exposure to Indoor Flame Retardants Disrupt Sympathetic and Hypothalamic-Pituitary-Adrenal (HPA) Axis Activity in Osmotic Challenged Rats

Research in our lab has demonstrated that perinatal exposure to the polybrominated diphenyl ether (PBDE) mixture, DE-71, triggers pressor responses to hyperosmotic stress in adult rats. To evaluate the effect of ganglionic blockade (GB), dams were dosed with DE-71 or corn-oil daily from gestational day 4 through postnatal day (PND) 21. At PND 60 offspring received hyperosmotic (3.5 M NaCl) or normosmotic NaCl (0.9 g%) i.p. with or without pentolinium tartrate (19.2 mg/kg). After 3 hours, blood pressure was measured as % Δ baseline using sphygmomanometry under isoflurane anesthesia. Hyperosmotic treatment produced a significant increase in systolic blood pressure (BP) in PBDE-treated rats compared to oil-controls, respectively (24.97 ± 2.55 vs. 1.53 ± 2.25%, n=22; p<0.001). GB partially occluded the pressor response in PBDE hyperosmotic rats by 12.85 ± 1.30% (n=12; p<0.01), suggesting involvement of sympathetic nervous system (SNS). Adrenal catecholamine (CA) content, measured via fluorometric detection, was not significantly reduced in oil hyperosmotic vs oil normosmotic rats. In comparison, CA content was about 4-fold lower in PBDE hyperosmotic vs PBDE normosmotic rats, respectively (5.4 ± 1.3 vs. 1.3 ± 0.4 mM; n=21, p<0.05), suggesting exaggerated CA release. This was not compensated for by increased mRNA levels for TH, PNMT or PACAP mRNA. Plasma corticosterone was significantly elevated in PBDE hyperosmotic rats vs PBDE normosomatic controls suggesting overactivation of hypothalamo-pituitary-adenal (HPA). Adrenal HPA markers appeared to rise in the PBDE hyperosmotic rats, but this was not significant. In conclusion, adult hyperosmotic treatment in rats perinatally exposed to PBDEs show disrupted SNS and CA balance and hyperactive HPA axis. Our findings reveal that PBDEs may target endocrine and autonomic systems associated with stress responses.

Sina Hananian, Biology
Faculty Mentor: Bradley White, Entomology
Influence of Technology among Californians in 2014

What is the use of technology influencing Californians today compared to a decade ago, and does this use depend on gender or age? This research project aims to answer this question by finding the time spent daily on computer use to judge how much technology is influencing Californians, and whether this influence differs by gender and age. Fifty random people in Hemet, California completed a survey. The target population is California residents, with the sample population of 50 Hemet residents. The location where the research was conducted was near the exit of Walmart. The survey required interviewees to provide information regarding age, gender, and the daily time spent using the computer. Ultimately, although the evidence gathered is not sufficient enough to determine whether technological influence has changed in comparison to recent years, it was successful in showing evidence that there is a difference between the daily time spent using a computer by Californians by gender as well as age since 2004.
Amanda Haraksin, Biology,  
**Faculty Mentor:** Edith B. Allen, Botany & Plant Sciences  
**Justin M. Valliere, Dept. Botany & Plant Sciences**  
**Variable Response of Native Species to Nitrogen and Soil Inoculum from Native and Invasive Species**

Nitrogen deposition from anthropogenic sources is increasing and can lead to excess nitrogen entering the environment, causing changes in plant community composition and loss of plant diversity. Nitrogen deposition has been shown to decrease the success of slower growing native plants, increase the invasion of annual grasses in coastal sage scrub (CSS) habitat, and influence soil biotic communities. We performed a greenhouse experiment to understand the effects of nitrogen, soil community, and the interaction between nitrogen and the soil community on the growth of five native CSS plant species. We hypothesized that the different species will respond differently to sterile, invasive and native soil inoculum and the response to high and low nitrogen treatments will vary with inoculum. Only one of five species, Eriogonum cinereum, had lower biomass with invasive than native inoculum. Two shrub species were similar in biomass under all inocula, with higher biomass in high than low N soil and no statistical interactions. By contrast, Eriogonum, had lower biomass in invasive than sterile soil with high N only. Stipa pulchra had higher biomass in both live inocula than sterile soil with high N but not low N, while Acmispon glaber had higher biomass with both live inocula in low N but not high N soil. The growth responses suggest that Acmispon requires inoculum for N fixing bacteria under low N, that Stipa requires mycorrhizal inoculum for uptake of high levels of N, and that Eriogonum may be limited in growth by microorganisms in high N, invaded soil.

Anne-Lise Helland, Anthropology  
**Faculty Mentor:** Professor Christine Ward Gailey, Anthropology  
**The German Nazi Party’s Lebensborn Program in Norway**

This research reveals the post-war silence surrounding the German Nazi Party’s eugenics Lebensborn program. The focus is on Nazi-occupied Norway during World War II, as well as the aftermath for thousands of Norwegian “War Children” and women involved in the program. The Lebensborn program was implemented with the sole purpose of creating a so-called racially pure Master Race, and to dilute or eliminate “non-Aryan Races”, such as the Jews and Roma (“Gypsies”). The Lebensborn program offered economic incentives and a stigma-free environment for “racially pure and healthy” unwed Norwegian women to bear “Aryan” children sired by German soldiers. The study investigates the Nazis’ treatment of the Norwegian “War Children” during the war. It compares the treatment of the children the Germans deemed “valuable” and the treatment of those children they considered “worthless”. The project also addresses the stigma, discrimination, harassment, and retaliation that Norwegian “War Children” and women who had relationships with German soldiers endured after the war. The presentation considers case studies of how this type of trauma has had long-term psychological and physical consequences for both women and their now-adult children. This research contributes to a better understanding of the relationship between eugenics and repressive reproductive policies and genocide.
Stephanie Herrera, Political Science  
**Faculty Mentor: Dr. David Pion-Berlin, Political Science**  
Street Gangs and Violence in Central America: The Effectiveness of Political Responses

Central America is recognized as one of the most violent regions of the world. Government and police institutions have identified the source of this high level of violence to derive from youth street gangs. The purpose of this paper is to perform a comparison analysis on El Salvador and Nicaragua to understand the development of youth street gangs within these countries. I examine the post-civil war political and social youth experience and its effects on the development of youth street gangs. I argue that El Salvador experienced a rapid development of gangs compared to Nicaragua due to repressive and social exclusion Salvadoran youth experienced. Secondly, this paper will examine how different government policies have either been effective or ineffective in response to street gangs and criminal violence within Central America. I argue that effective government policies must include preventive programs in order reduce street gang violence within Central America. I analytically examine criminal rates and gang membership during the time that each policy was implemented in order to determine the effectiveness of each policy.

Kara Homolak, Business Administration  
**Faculty Mentor: Sherryl Berg-Ridenour, Business Administration**  
Social Media Marketing: Analyzing the Current Ethics, Regulations, and Profiles that Target United States Minors

The use of social media in today society has been growing exponentially over the past years throughout all age groups. Due to the heavy usage of social media, advertisers capitalized on the opportunity to use this as an outlet for advertising campaigns. Adolescents are becoming “connected” to the internet and social media sites at younger ages than ever before and are feeling the need to stay connected at all hours of the day. The problem with this is that there are opportunities to unethically advertise to minors with little to no accountability. This allows marketers to target and reach children starting from younger ages through social media and there currently are no federal regulations and very few states-level regulations to protect minors from unethical and unmoral marketing practices. What are the common ethics that current Social Media Marketers follow? What company Facebook profiles displays these ethics and which ones do not display these certain ethics? What legislation should be created to protect minors from unethical advertising in the future? What should companies do to advertise ethically?
**Travis Hong, Environmental Science**  
**Faculty Mentors: Laosheng Wu, Environmental Sciences; Milt McGiffen, Botany & Plant Sciences**  
The Effects of Four Biochars of Differing Particle Size Classes on Soil Water Retention Across Three Soil Textures

Biochar is the primary product that results from pyrolysis, the process whereby plant matter is raised to high temperatures in a low oxygen environment. Depending on the pyrolysis conditions and feedstock, biochar varies in their potential to benefit soil quality and sequester carbon. Our research objective is to quantify the effects of four different types of biochar (biosolids at 350°C, yellow pine at 550°C, coconut shells at 550°C, and pine wood at 300°C) on water retention capacity (WRC) on soil samples of three different textures—sand, sandy loam, and clay—by measuring water content at 0.1 bar, 0.3 bar, 1.0 bar, 5 bar, and 15 bar in pressure chambers. The four types of biochar are all applied at 2% (w/w) rate but were separated into 3 size fractions (large, > 50 μm; medium, 2 μm to 50 μm; and small, < 2 μm) to assess the effect of char particle size on water retention. Plant available water (PAW) was calculated from the difference between field capacity (0.3 bar) and wilting point (15 bar). In the sandy loam, medium sized biochar had greater increases in PAW than small sized biochar. In contrast, in PAW increases were greater for small sized biochar amended clay soil compared to the medium sized biochar. Biochar particle size affected PAW increases in the sand, but the difference varied depending on the biochar. This analysis concludes that biochar application increases WRC in sand and clay soils, but has variable effects in sandy loam depending on the biochar.

**Lorraine R. Horwitz, Biochemistry**  
**Meng Zhao, Biology**  
**Faculty Mentor: Wendy Saltzman, Biology**  
Effects of Parental Status on Male Body Composition and Diet Preference in the Biparental California Mouse

The physiological, behavioral, and energetic costs of reproduction and parental care have been studied extensively in mammalian mothers, while few studies have examined the costs associated with paternal care in mammalian fathers. This study aimed to characterize possible energetic costs associated with fatherhood in the monogamous, biparental California mouse (*Peromyscus californicus*). Virgin males (n=14-15), males housed with tubally ligated females (non-breeding males, n=14), and new fathers (n=14-15) were weighed twice per week from pairing until the birth of their first litter (or an equivalent time period for for virgin and non-breeding males); testing began 3-5 days later. Data collected included body mass, body composition (fat and lean masses), and preference for a high-fat diet. We found no significant differences among reproductive categories in any of these measures; however, the decline in body mass across the course of the study tended to be smaller in virgin males compared to non-breeding males and new fathers, with new fathers having the largest drop in body mass. These results suggest that fathers do not have higher energetic costs than non-reproductive males in a monogamous, biparental mammal, at least under laboratory conditions. Future studies in long-term breeding males living under more challenging environmental conditions may reveal higher energetic costs associated with paternal care.
Kenneth Hsu, Statistics
Faculty Mentor: Professor Daniel Jeske, Statistics
Group Sequential Clinical Trials for Gamma Distributions

Group sequential clinical trials for comparing a control group with a treatment group utilize a sequential hypothesis testing procedure where the total sample size for the experiment is not fixed in advance. Instead, data is evaluated at the end of each testing stage, and additional data collection from each group is only deemed necessary if a confident decision about the null hypothesis cannot be reached at that respective stage. An advantage of group sequential clinical trials is that this design has a smaller average sample size, hence lower cost, than traditional fixed sample size clinical trials that have the same levels of confidence. Group sequential clinical trials also align with proper ethics since their potential for early stopping can prevent administration of inferior treatments to patients participating in the trial. While there is abundant literature concerning the design and analysis of group sequential clinical trials for normally distributed variables, the literature is sparse when the response variable is a non-negative or skewed variable, such as recovery time from an illness. In this paper, an algorithm is developed to compute the decision boundaries for a two-stage group sequential clinical trial under a gamma distribution, and is implemented using the programming language, R. Illustrative tables of the decision boundaries will also be presented.

Andrew Huang, Neuroscience
Faculty Mentor: Dr. Victor Rodgers, Bioengineering
Significance of Aquaporin 3 in Pancreatic Cancer Cell Susceptibility to Exogenous Hydrogen Peroxide Therapy

Phase 1 clinical trials have shown vitamin C (ascorbate) to be a successful prodrug in significantly reducing pancreatic tumors. In the body, ascorbate undergoes a series of reactions producing extracellular hydrogen peroxide (H$_2$O$_2$) which, in vitro, has been found to be selectively toxic to pancreatic cancer cells, but not to normal cells at high concentration. It is hypothesized that the over-expression of aquaporin 3 (AQP3) in pancreatic cancer cells causes an accumulation of intracellular H$_2$O$_2$ thus mediating cell death. Our work aims to investigate whether AQP3 plays a role in the susceptibility of pancreatic cancer cells. We have observed a significant decrease in the H$_2$O$_2$ uptake when AQP3 has been silenced which indicates that AQP3 may be a contributing factor to the transport of H$_2$O$_2$ and perhaps a reason for the susceptibility to ascorbate therapy.

Denise Huipio, Sociology
Faculty Mentor: Augustine Kposowa, Sociology
Social Disadvantage and Life Expectancy in California Counties

An important element in determining population health is the physical quality of life of its members. A major quality of life indicator is life expectancy. Although life expectancy has generally increased in the United States in the past two decades, there still remain disparities in counties by race/ethnicity. The purpose of this research is to quantitatively examine the sources of these racial/ethnic differences in life expectancy using California’s 58 counties. It is hypothesized that once sociological and structural factors such as social disadvantage, socioeconomic status, and health indicators are taken into account, observed racial/ethnic disparities in life expectancy will be reduced substantially, if not completely eliminated.
Allison Ibarra, Biological Sciences  
Faculty Mentor: Wendy Saltzman, Biology  
Effects of Housing at Differential Temperatures on Energetics and Performance in the California Mice

Energetic costs of thermogenesis and locomotion have been shown to be largely additive in small mammals. At cold temperatures resources must be allocated between thermogenic and locomotor needs. Our study tested the hypothesis that several morphological and performance measures (body mass, VO$_2$max, and maximum sprinting velocity) would be affected in animals housed at cold temperatures. Male California mice (*Peromyscus Californicus*) were placed into two different housing conditions: at a standard temperature of 23°C (N=29) or at a cold temperature of 5°C (N=29). The mice were acclimated to their housing temperature for two weeks before testing. During testing, males underwent a series of procedures over 7 days. On day 5 and again on day 6, male mice underwent a VO$_2$max test once and a sprint-speed test once at approximately 23°C. The mass of the mice was also determined each day. There was no significant difference in body mass between housing conditions. Mice housed at cold temperatures had significantly higher VO$_2$max when controlling for body mass of the animals (p<0.05). These results suggest that housing at cold temperatures increases maximal energy expenditure during exercise but does not necessarily alter body mass or sprint performance.

Nikta Jaberzadeh, Psychology  
Faculty Mentor: Rebekah Richert, Psychology  
The Influence of Primary Language in Children’s Cognitive Development

Past research has indicated that the developmental trajectory of theory of mind in children is influenced by many cognitive factors, such as linguistic knowledge and executive functioning skills. In fact, bilingual children have demonstrated higher levels of executive functioning and theory of mind than monolingual children. However, it is important to examine bilingual children’s performance based upon the language that they are tested in. As a result, the current study expands on previous literature by focusing on the importance and influence of native language on the cognitive performance of children during these tasks. Over 80 monolingual and bilingual children were presented theory of mind and executive functioning tasks in their native language or English. It is anticipated that bilingual children will have higher levels of executive functioning when tested in their native language rather than in English, but will pass theory of mind at similar rates as monolingual children.
Afshin Jahromi, Bioengineering and Winson T. Wong, Bioengineering  
Nicole R.L. Sparks  
Faculty Mentor: Nicole I. Zur Nieden, Cell Biology & Neuroscience  
Comparison between Carbon PEEK and Stainless Steel as a Bio-implantable Material

The purpose of the experimentation is to assess the effects of carbon PEEK as a biomaterial to be used for orthopedic implants. Stainless steel has long been the material of choice to be used in orthopedic surgeries due to its cheap cost and strong mechanical characteristics. However, stainless steel has compatibility issues with modern imaging techniques and can also corrode in the body. These issues provide a motivation to seek alternative bio-implantable materials. The ability of such a biomaterial to support cell adhesion and spreading is an essential factor reflecting its level of biocompatibility and subsequent osseointegration. Thus, a series of in vitro tests utilizing human embryonic stem cells, capable of osteoblast differentiation, have been constructed to assess the differences between carbon PEEK and stainless steel in facilitating bone growth. An adhesion test was initially performed and the carbon PEEK was able to grow a comparable number of cells compared to stainless steel. A calcification assay and various imaging techniques were then conducted to assess the levels of calcium deposit per amount of cellular protein. The data retrieved from these assays illustrated that the carbon PEEK material effectively allowed for the production of comparable levels of calcium and protein when compared to stainless steel.

Charlotte Kane, Creative Writing  
Faculty Mentor: Nalo Hopkinson, Creative Writing  
Once More Unto the Longboats: A Creative Re-imagining of Norse Lore Through Modern Prose Fiction

To follow the lineage of most Eurocentric science fiction and fantasy, one must root out the myths and legends from history from which these stories stem. One trail particularly important to the modern SF/F genres is that of Norse Mythology, and I’d like to go back to the source material and reimagine the tales. We all know the Tolkien-esque version: fair-faced elves and stocky dwarves, hobbits and dragons, beasts and wizards, humans caught somewhere in the midst of magic and nobly pressing onwards in their humble and heroic way. But what if that wasn’t how things were? What if the dwarves weren’t smiths or the elves weren’t wise? What could these characters, stories, and styles say about the ancient Norse and what can I say about the modern world through their reinterpretation? We grasp what is popular, what is already done. Tolkien took myth and made a dynasty that is now the high fantasy genre. But what connections can be drawn between the original texts and modern life, without all the little steps in between? With respect and admiration to historiography, I’d like to go back to history. To this end, I will be creating a collection of short stories with modern reinterpretations and applications of traditional Norse lore.
Alexia King, Biochemistry  
Faculty Mentor: Ernest Martinez, Biochemistry  
Elsie Gonzalez, Biochemistry  
Muyu Xu  
Characterizing the Interactions between High Mobility Group AT-Hook 1 (HMGA1) and TFIID and Mediator Complexes

The non-histone chromatin protein, High Mobility Group AT-Hook 1 (HMGA1) is overexpressed in cancer cells and in normal proliferative cells such as embryonic stem cells. HMGA1 overexpression is considered a hallmark of cancer as it accumulates to high levels in cells of most types of tumors. HMGA1 is not only a cancer biomarker but also may represent a potential target for drug discovery and therapeutic intervention. Our lab recently identified a novel function of HMGA1 at the core promoter region of certain genes. Within the core promoter, TFIID recognizes and binds specific core promoter DNA sequence elements such as the TATA box via its TATA-binding protein (TBP) and the Initiator (INR) via its TBP-Associated Factors (TAFs). In our lab, we are interested in defining the novel role of HMGA1 in facilitating the transcriptional synergy of TATA and INR elements via HMGA1 interactions with TFIID and Mediator. Using nuclear extracts from HEK 293 cells, Glutathione S-transferase (GST) pull-down assays were performed with recombinant HMGA1 wild type and mutant proteins (lacking different protein domains) fused to the GST protein. Through Western Blot analyses, we observed that the presence of the acidic carboxy-terminus tail (C-tail) increases the interaction of HMGA1 with TBP. These results may suggest that the C-tail domain of HMGA1 could also be necessary for interacting with other components of the TFIID complex. Future experiments will aim to further identify the interactions between TFIID, as well as Mediator, that are responsible for the synergy in core promoters containing TATA-box and INR elements.

David Kopp, Creative Writing  
Faculty Mentors: Mike Davis (retired) and Brandon Williams, Lecturer  
Cowtown: A novella

Most cultures are plagued by the societal poisons of homophobia, sexism, and racism to some extent. Cowtown is a semi-autobiographical novella set in Calgary, Canada in 1996. Darren is a high school senior who strains to come to terms with the rugged environment that surrounds him while pursuing companionship with a female that his caustic best friend does not approve of. This story is important because it highlights not only the struggles of the actual victims, but also the more subtle peer pressures felt by those who are not directly impacted, who feel compelled to go along with the group think in order to fit in, especially while in high school where reputations are so important. Darren begins as the observer of the victims, but eventually gains the courage to stand up and speak out on their behalf. Gay, lesbian, and racial minorities need the support of a sympathetic and understanding majority in order to change minds and change society for the better. I hope this story will help to inspire others.
Gloria Kyallo, Political Science  
**Faculty Mentor: Dr. Bronwyn Leebaw, Political Science**  
Examining the ICC from a Restorative Justice Perspective

The International Criminal Court (ICC) has often been viewed from a retributive justice and deterrence perspective. However, the ICC moves beyond the scope of a traditional court and aims to provide restorative justice through the Victims and Witnesses Unit (VWU) and The Trust Fund for Victims (TFV). The VWU and TFV were both established under the Rome Statute to provide support for victims and witnesses. My research question examines how the ICC implements restorative justice by examining the current work done by the VWU and the TFV in the Democratic Republic of Congo (DRC) and in Northern Uganda. This thesis addresses this question by examining a report done by the Human Rights Center at the University of California, Berkeley School of Law, on the VWU and evaluation reports done by the TFV on their programs in the DRC and in Northern Uganda. This investigation is imperative because it studies exactly how the ICC implements restorative justice and compares it to the four facets of restorative justice set by the South African Truth and Reconciliation Commission (TRC), and the ICC’s definition of restorative justice. My overarching concern is whether or not the ICC can be seen from a restorative justice perspective given that it has often been viewed from a retributive and deterrence perspective. The goal of my argument is to show that the ICC is an arbitrator of restorative justice by examining the work done by the VWU and TFV.

Shirley Leanos, Psychology  
**Faculty Mentor: Professor Rebekah Richert, Psychology**  
Our Take on Terrorism: From Childhood to Adulthood

Since the rise of terrorist groups in opposition to the United States, American citizens have been increasingly exposed to traumatic events, such as the September 11th attacks by Al-Qaeda and the beheadings of American citizens by the Islamic State of Iraq and Syria (ISIS). At the time of the September 11th attacks, today’s young adults were children, and currently they still continue to experience terrorist crimes. Therefore, the purpose of this study was to examine whether different variables affect children’s experience of terrorist events and if they influence later experiences of terrorist events. Specifically, we looked at variables including the level of media exposure and parents’ reactions to the September 11th attacks. We examined if these variables influenced a child’s reactions and opinions of the attacks. Thereafter, we analyzed if the reactions and opinions that one formed of the September 11th attacks as a child influenced one’s current reactions and opinions of recent terrorist events.
Christopher Lee, Chemistry
Faculty Mentor: Ludwig Bartels, Chemistry and Material Science
Sahar Naghibi, David Barroso, Velveth Klee, Ariana Nguyen, Edwin Preciado, Quan Ma, and John Mann
CVD Growth and Characterization of Single Layer MoS$_2$, MoSe$_2$, and MoS$_{2(1-x)Se_{2x}}$

Among various two-dimensional materials, transition metal dichalcogenides (TMDs) have attracted much interest because they provide tunable and direct-bandgap semiconducting properties at the single-layer limit. The presence of the direct bandgap in single layer MoS$_2$, MoSe$_2$, and MoS$_{2(1-x)Se_{2x}}$, coupled with strong photoluminescence is of interest for optoelectronics because the bandgap can be tuned depending on composition. While exfoliation is a commonly accepted process for fabricating single-layer MoS$_2$ and MoSe$_2$, this method is impractical for large-scale production and is limited to naturally occurring materials. Using both organic and inorganic precursors, we perform a chemical vapor deposition (CVD) process to synthesize not only single-layer MoS$_2$ and MoSe$_2$, but also alloyed material with sulfur and selenium, MoS$_{2(1-x)Se_{2x}}$ on SiO$_2$/Si substrates. By varying the amount of selenium and sulfur present in the film, we are able to tune the bandgap anywhere between 1.89 eV (pure MoS$_2$) and 1.55 eV (pure MoSe$_2$). Through CVD, TMDs form as both single crystals (islands) up to tens of microns in size and as film, composed of coalesced islands, hundreds of microns in size in the monolayer state. Additionally, alloyed film is found not only as one particular ratio of Se:S, but in a range of composition where the ratio changes over a micron scale. Islands and film of varied Se:S ratio are characterized using Raman, photoluminescence, and AFM among other techniques. Using electron beam lithography and evaporation, titanium/gold devices are placed on alloyed material for future measurements comparing the electrical properties of the various MoS$_{2(1-x)Se_{2x}}$ materials.

Fransiska Lee, Biology
Faculty Mentor: Dr. Leonard Nunney, Biology
Evaluating the Link between Measures of Body Size and Evolutionary Fitness in Female Drosophila melanogaster

The body size of an organism is linked to its evolutionary fitness. The most commonly used metric of size in live animals is wet weight. However, weight can fluctuate drastically and unpredictably within the life span of an individual and therefore be misleading. In this study, I test whether morphometric traits such as thorax length, wing size, head width, femur length or tibia length are more closely related to evolutionary fitness than body weight. My goal is to determine which metric of body size serves as the most reliable predictor of evolutionary fitness. My experiment tests a key assumption about body size in the fields of ecology and evolutionary biology. The results would guide future studies about which metric of body size is most useful to measure. I will record the number of eggs laid by individual females of Drosophila melanogaster to assess their evolutionary fitness. Subsequently, body size is measured for each individual. Wet and dry weight is measured on an electro microbalance. Each individual is dissected and morphometric measurements using microscope photography and software-assisted analysis using TSVIEW 7.0 software. The correlation between the recorded size traits and fecundity for each individual is calculated using Minitab 16 Statistical Software. Multivariate analysis is used to determine if a particular combination of traits may serve as a better predictor of fecundity than a single trait.
Matthew Leitao, Psychology  
Faculty Mentor: Dr. Megan Robbins, Psychology

It's Not What You Say But How You Say It: Vocal Tone and Emotion Among Women Coping with Breast Cancer

Vocal tone may be important in coping with stressful situations such as breast cancer. Due to lack of research in this area, this was a feasibility study examined pitch (fundamental frequency), formants (additional frequencies), and general energy (amount of joules) from sound files recorded from the daily lives of three women with breast cancer. These participants were selected from a larger study (Robbins et al., 2014) based on their scores from the PANAS, a questionnaire measuring emotion, to represent an emotionally positive, negative, and neutral participant, relative to the larger sample. The sound files were recorded using the Electronically Activated Recorder (EAR) over a weekend. The files were processed through PRAAT to extract pitch, formants, and general energy. Files were also coded by research assistants for positive, negative, neutral, and mixed emotion to serve as a comparison to the vocal tone data. The results indicated that pitch and formants differed significantly for each participant. The positive participant had the highest pitch (followed by the negative, and then neutral participant) and almost double the standard deviation, indicating greater pitch variation compared to the others. Coded affect did not differ by vocal tone, except those coded as mixed affect had a larger mean and greater variation in general energy. This feasibility study revealed that there is a detectable difference between people who experience positive, negative, and neutral emotion and their vocal tones. Future research is necessary to investigate the connections between vocal tone and coping with a larger sample of participants.

Ingrid Liao, Chemistry  
Faculty Mentor: Dr. Ludwig Bartels, Chemistry

Ariana Nguyen, Brandon Davis, Gretel Von Son, Velveth Klee, Sahar Naghibi, I-Hsi Lu, and Edwin Preciado

Monolayer Molybdenum Disulfide Growth Over SiO2/Si Trench-Patterned Wafers

Monolayer transition metal dichalcogenides (TMDs) as semiconductor materials are desirable because they exhibit many outstanding optical and electrical properties. Molybdenum disulfide (MoS2) distinguishes itself from graphene by its direct band gap at the single-layer limit. In this project, we synthesize molybdenum disulfide with a direct band gap of ~1.85eV over trench-patterned SiO2/Si wafers using the chemical vapor deposition (CVD) method. Samples are characterized by means of Raman and photoluminescence spectroscopy. Through this research project, we will study the effects of suspension and ensuing absence of substrate interactions on photoluminescence properties of the material. We critically compare it to an unsuspended monolayers on 300nm SiO2/Si substrate. Ultimately, our study will lead to the evaluation of the mechanical properties of suspended MoS2 films.
Emily Lopez, Anthropology  
**Faculty Mentor: Dr. Juliet McMullin, Anthropology and Dr. T.S. Harvey, Anthropology**  
**Doctor-Patient Communication**

In a doctor-patient relationship, communication is considered a key element to provide quality care. It is a necessary tool in order to avoid errors, improve care, and achieve better health outcomes. Most of the time physicians are characterized as scientifically oriented based on the training and practice they are given. The control of medical knowledge, technical procedure, and rules of behavior, as well as control of patients’ access to and understanding of information on which treatment decisions are made, creates a world of power for the medical profession (Lazaraus, “Medical Anthropology Quarterly”, 34). Patients feel that they are not being acknowledged as a whole human being, only observing their physical state, but missing elements that include language, customs, beliefs, values, religion etc. In order to improve individual's health and build healthy communities, we need to recognize that communication and culture competency are a critical part to improve quality of health. This project aims to explore the physician’s perceptions about doctor-patient communication in the clinic. It will examine a physician’s approach to doctor-patient communication by analyzing the structure of the medical interviews. While analyzing these interviews, the project will address physician challenges that culture differences puts on the standard medical practice. By utilizing relevant literature, interviews, and video clips I will be exploring how aspects of communication and culture regarding the body, communication, health, and illness are elements that need to be implemented into the formulation of improving a patient’s health.

Author: Ashley Mallard, Political Science  
**Faculty Mentor: Jan Blacher, Graduate School of Education**  
**Leigh Ann Tipton, Graduate School of Education**  
**Do you have friends? Early Friendship Concept and Quality in Children with Autism Spectrum Disorder**

Research has shown that high functioning adolescents diagnosed with autism spectrum disorder (ASD) face higher likelihood of internalizing disorders, such as depression or anxiety, than those without ASD, possibly due to their deficits in social functioning. There is additional evidence pointing to friendships serving as a protective factor against internalizing symptoms in children with, and without, ASD. The purpose of this study is to expand prior research with adolescents by investigating friendships and internalizing problems in a sample of young children with ASD. Specifically, the quality of friendships and the concept of friendship, as reported by the children (ages 4 to 7, \( M = 5.13 \) years) themselves, will be examined. A two-way ANOVA will be run to examine mean differences in internalizing symptoms as reported by parents (dependent variable); child-reported friendship quality and friendship concept are independent variables. Both main effects and interaction effects will be considered to examine how self-reported friendships impact the development of later internalizing behaviors. Our expectations are that young children with a better understanding of what it means to be a friend will experience significantly higher or lower levels of internalizing behavior, depending on the quality of the friendships. Similarly, the children with little to no concept of friendship, regardless of the presence of quality friends, will face fewer instances of internalizing behaviors.
Author: Melissa Mikail, Philosophy/Law and Society  
Faculty Mentor: Carl Cranor, Philosophy  
More than Skin Deep: The Hidden Injustice that Compromises Our Health

Industrial chemicals permeate and contaminate our daily lives in numerous ways ranging from the food we eat, the clothes we wear, to the furniture upon which we sit. Every aspect of our life intersects with harmful industrial chemicals that we absorb and ingest through various means and pathways. Outdated federal law fails to sufficiently protect us from chemicals that can lead to irreversible diseases, allowing cancer-causing chemicals and disruptors in daily-used products. My project entails an examination of three disciplines: toxicology, law, and philosophy. The purpose of my project is to study the chemicals that permeate our daily lives, namely those found in cosmetics and personal care products. I will situate my study within a legal framework to better understand the business of toxicology and illustrate its disproportionate effects on class structures, particularly the disadvantaged communities.

Author: Madeline Mullen, Bioengineering  
Faculty Mentor: William Grover, Bioengineering  
Testing and Design of Benchtop Coulter Counter

The Beckman Coulter Counter has become the gold standard in cell counting and sizing. Beckman's device has revolutionized the method of particle detection, requiring only dielectric material and a sensing aperture. Prior to the Coulter Counter, cells were either manually or optically analyzed. However, in a Coulter counter, cells in conductive solution are forced to flow through a small aperture, the approximate size of the cell, which creates current impedance. The impedance created as a single cell momentarily blocks the aperture can be detected through the use of an ammeter, voltmeter, or oscilloscope. The amount of impedance is directly proportional to the size and/or volume of the cell. This quick detection method, allows for rapid processing of many different samples, at the single cell level. Popular uses today include blood counts, malaria and sickle cell anemia diagnosis, and particle detection.

Despite its popularity the Counter has several limitations including its bulky size, high cost, and limited compatibility with other diagnostic tools. My project will investigate an alternative method for design and fabrication of the coulter counter. This alternative method will employ the use 3D printed materials for affordability and versatility. The designed Coulter counter insert will be compatible in a bioreactor to allow for cell sorting and/or cytotoxicity testing.
Author: Christine Muñoz, Sociology  
Faculty Mentor: Tanya Nieri, Sociology  
How do Spanish-speaking Women Subjectively Experience the Sexuality in Zumba Fitness?

Zumba, a form of group fitness exercise that is inspired by Latin American dance music, is hugely popular worldwide and in the US. Because of its explicit inclusion of Latin culture, Zumba may reduce racial health disparities by drawing Latina women into group fitness. Zumba incorporates provocative hip hop moves and Latin dances like bachata, merengue, and salsa. I studied the experiences and reactions to the sexual movements that Zumba displays in its choreography. I qualitatively interviewed 15 Spanish-speaking, adult, female participants from Zumba classes in the Inland Empire. The interviews focused on women’s subjective experiences of Zumba, including its cultural content. The present analysis draws on current debates in feminism about the merits for women of group fitness as well the sexualization of culture to assess the participants’ experience of Zumba’s incorporation of sexuality: whether and how women experienced aspects of the class as sexual, and whether and why the women enjoyed these aspects. As such, it examines Zumba’s potential impact on gender disparities. The analysis yielded that all fifteen participants loved Zumba and each participant fell into one of four categories of subjective experience. Six participants said they loved Zumba’s sexual elements and felt comfortable performing sexy moves in class. Four participants found the sexual moves to be acceptable, but they would not necessarily perform them publicly. Two participants found Zumba’s sexual elements to be unacceptable and refused to perform sexy moves in class. Finally, two participants did not perceive it to be sexual. Prior exposure to exercise or dance appeared to be related to an identification and appreciation of Zumba as sexual. Women’s overall favorable experience of Zumba, despite variations in the evaluation of Zumba as sexual, suggests that the women perceive Zumba to provide a positive space for them.

Alina Muradyan, Anthropology  
Faculty Mentor: Juliet McMullin, Anthropology  
Fighting Risks: Beyond the Physical in MMA

This project examines Mixed Martial Arts (MMA) fighters perceptions of their work. From mental to financial benefits of MMA, this work considers what fighters consider positive benefits and their hopes for this bodily harming work. Drawing on an in-depth interview with Georgi Karakhanyan and an ethnography of the gym where he trained, I examine three theoretical concepts, risk theory and precarity that frame the project and facilitate a questioning of the social relationships that give meaning to MMA. These theories give insight into why an athlete would choose MMA when they know the possible physical, mental, emotional repercussions. My findings suggest that Georgi and other fighters make sense of their risky work through the hope of inspiring young people to do more with their lives.  
PLEASE VISIT alinamuradyan.weebly.com for more information about project.
Sahar Naghibi, Chemistry
Faculty Mentor: Ludwig Bartels, Chemistry
Brandon Davis, I-His Lu, Velveth Klee, Edwin Preciado, Ariana Nguyen, and David Barroso
CVD Growth and Characterization of Single Layer MoS₂ on Patterned Substrates

Among various two-dimensional materials, transition metal dichalcogenides (TMDs) have attracted much interest because they provide tunable and direct-bandgap semiconducting properties at the single-layer limit. The presence of the direct bandgap in single layer MoS₂, coupled with strong photoluminescence is of interest for optoelectronics. In contrast to exfoliation, chemical vapor deposition (CVD) is used to obtain larger monolayer areas. With the CVD method, TMDs form as islands and as films composed of coalesced islands. I will report the growth of islands and films of varying dimensions on patterned substrates. Raman and photoluminescence spectroscopy were used to characterize the film and validate their monolayer nature. We explore the electrical properties of growth on patterned substrates by lithographic fabrication of contacts in UCR’s cleanroom.

Sandor Nagy, Global Studies
Faculty Mentor: Christopher Chase-Dunn, Sociology
One Planet, One Home, One Responsibility

The purpose of this paper—in addition to a brief overview of its roots in World History—is to provide a better understanding why the establishment of global governance by a global government—based on global democracy—is not only possible, but increasingly more important and necessary in the 21st Century. We can observe and examine, as well as analyze an evolutionary process of local, regional, and global power from the Peace of Westphalia in 1648—the birth of modern nation-states, including the U.S. in 1776—to the establishment of the United Nations in 1945—to our rapidly globalizing world today. In order to solve—in addition to our common problems on this planet, such as climate change and global warming—the major conflicts in the current “hot spots”—including the ISIS-crisis, the Russian-Ukrainian crisis, the Israeli-Palestinian conflict, and the Ebola outbreak in West Africa—global cooperation is essential, like never before. We already think globally. We already act locally. The time has arrived to act globally.
Yeena Ng, Biology
Faculty Mentor: Dr. Victor G. J. Rodgers, Bioengineering and Biomedical Sciences
Paracellular Transport of Acetaminophen Across Human Mucosal Epithelial Monolayer

Enterocytes are mucosal epithelial cells lining the intestines that function in nutrient uptake. These mucosal cells develop microvilli as they mature that collectively form a brush border. Previously, the brush border of mucosal epithelial cells was thought to amplify uptake by increasing surface area. However, studies have shown that the electrostatic properties of brush border may serve as a barrier, rather than enhancer, in particle absorption; Vandrangi et al. (2013) recently demonstrated a decrease in normal zeta potential of Caco-2 (human mucosal epithelial cells) with the growth of microvilli, or increase in surface area. In order to further understand how the brush border affects particle movement across the mucosal barrier, we must first take the mass transport across the tight junctions between mucosal epithelial cells into consideration. Our studies focus on apical paracellular transport of small, polar molecules (specifically acetaminophen) across the mucosal barrier. A monolayer of Caco-2 BBE is cultured in ADMEM on 3.0 µm-pore polycarbonate membranes that are then placed between two chambers of PBS, where the chamber in direct contact with the cells holds acetaminophen. Samples were collected from the back chamber over a period of one hour to observe concentration changes, of which a mass transfer coefficient is calculated from, implying transport across the membrane. This coefficient will allow future studies on transport across the brush border to take paracellular transport into consideration. Better understanding electrostatic properties of enterocyte brush border will allow for development of more effective mucosal vaccines and delivery strategies across the mucosa.

Julie Ngo, Literature and Languages, Chinese
Faculty Mentor: Dr. Christopher Chase-Dunn, Sociology
Survey of Popular Perceptions of China: A Conundrum

China’s developing economic power has led to its increasing importance on the world stage due to the rising power of its economy, technology, and native language and culture. In most cases, the American populace has proven to attract negative opinions towards nations that rivaled U.S. global dominance, especially Communist nations such as the Soviet Union, Cuba, and North Korea. For example, in the Korean War, America and China were adversaries and thought poorly of each other as such. However, data from my survey shows that there were more positive than negative American sentiments towards China. Overall, the responses to questions about visiting China, finding opportunities there, China’s future political and economic status, and its role in the world were moderately positive. These positive responses demonstrate that the perception of China held by the American populace has improved over time. Therefore, the main focus of this project is to analyze how and why China has been gradually escaping from these negative sentiments by contextualizing my data within the findings of current scholarship and research.
Casey Nguyen, Neuroscience  
Faculty Mentor: Dr. Maxim Bazhenov, Neuroscience  
The Effects of Astrocytic Potassium Buffering on Epileptiform Hysteresis  

Epileptiform (EF) activity is the distinct pattern of paroxysmal activity resembling those recorded in a proportion of patients suffering from epileptic disorders. Such patterns of activity have been shown to be associated with increased extracellular potassium concentrations. Additionally, EF frequency exhibits a positive relationship with the extracellular concentration of potassium ([K⁺]o). Computational modeling has demonstrated that extracellular potassium concentration generates a hysteresis in its effect on epileptiform discharge frequencies. It is well known that astrocytes play an important role in the regulation of extracellular potassium concentration. However, the effect of astrocyte potassium buffering on the EF discharge frequency hysteresis curve is not known. Here, we studied the relationship between [K⁺]o and EF frequency as described by the hysteresis curve changes when the astrocytic Kir4.1 channel is inhibited. We hypothesize that this inhibition of the astrocytic Kir4.1 channel, through bath application of BaCl₂, will shift the hysteresis curve, and affect epileptiform discharge patterns. We found that bath application of BaCl₂ shifted the hysteresis curve such that [K⁺]o in the falling phase of the curve generated EF patterns with higher frequencies than the respective concentrations of K⁺ in the control hysteresis curve.

Jessica Nguyen, Biological Sciences  
Faculty Mentor: Dr. Subir Ghosh, Statistics  
Evaluation of Hygiene Kits Usage and Satisfaction of Riverside Free Clinic Patients for Improving Their Overall Health and Quality of Life  

Growing from the collaborative concerns of students and doctors disturbed by the number of Riverside, CA locals without basic healthcare, UCR’s non-profit Riverside Free Clinic (RFC) was established in 2005. Recognizing the importance and need for managing personal hygiene among patients, the Hygiene Kits Committee was created within RFC to obtain and distribute toiletries to the clinic’s visitors. Many of RFC’s patients greatly rely on these kits to maintain their personal hygiene; however, recently, it was brought to the clinic’s attention that the toiletries provided were not enough to sustain them until subsequent clinic dates. The current goal of the Hygiene Kits Committee then, is to provide these patients with a larger variety and quantity of hygiene supplies, all while working within the clinic’s financial constraints. As an aid, this study was carried out to explore patients’ satisfaction towards the distributed hygiene kits, as well as their level of usage of the contents included. Paper surveys conducted in English and Spanish were distributed at RFC to collect the pertinent information. Beginning in the summer of 2015, RFC will use the analyzed results of these findings to effectively maximize their resources and refine their hygiene kit services, thereby bringing them closer to improving the overall health and quality of life for their patients.
Martha E. Nunez Ornelas, Physics and Applied Math  
Faculty Mentor: Bill Gary, Physics & Astronomy  
Search for Supersymmetry at the LHC in Direct Top Squark Production with many Jets and Large Missing Transverse Energy in the Final State

Scientific knowledge of matter and forces at the most fundamental level is described by a collection of theories known as the Standard Model (SM). The SM has proven to be extremely successful in describing particle physics phenomena very precisely. However, it is not regarded as a complete theory of fundamental interactions. Some of the most important limitations are that it does not provide the theoretical framework for the gravitational force or dark matter. Supersymmetry (SUSY) is a very appealing extension to the SM that provides a candidate for dark matter and perhaps a link to gravity. Finding evidence for SUSY or some other extension to the SM is one of the chief goals for the experiments at the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN). SUSY predicts a partner particle, referred as superparticle, for each particle in the SM. If they exist and are within the LHC energy regime, superparticles will be observed in the upcoming LHC data-taking periods starting in 2015. A search for SUSY particles is presented using Monte Carlo simulated events in preparation for data to be taken by the Compact Muon Solenoid (CMS) experiment at the LHC in the summer of 2015. In this analysis I am searching for SUSY signals stemming from direct stop quark (stop) production in proton-proton collisions with many jets and large missing transverse energy in the final state.

Roman Nuñez, Sociology  
Faculty Mentor: Tanya Nieri, Sociology  
UCR Undergraduate Student-parents’ Perceptions of Campus Family-friendliness and their Academic Performance

This study fills the gap in research on student-parents by examining how student-parents at UCR experience the campus climate with regard to family and the impact of that experience on academic outcomes. Campus climate has been defined as individuals’ or groups’ experience on campus and their evaluation of equality. This study focuses on campus climate in terms of student-parents’ assessment of the university’s family friendliness. Its theoretical framework is intersectionality. Student-parents are disproportionately female, lower income, and racial/ethnic minority, and thus, are at the intersection of several social statuses as well as two social roles (parent and student). Using survey data from 67 undergraduate student-parents collected in 2014, this study examines the distribution of student-parents’ assessment of the campus as family friendly and the relationship of perceived family-friendliness with academic performance. Results were that 59% perceived the campus to be family friendly. The mean GPA in the sample was 3.0 (SD = .632). The mean of hours studied per week was 25.65 hours (SD = 16.337). Thirty-two percent of student-parents were on academic probation. Twenty-two percent of student-parents were engaged in academic research. Grade point average \( f = 1, p = .413 \) and research engagement \( f = 1, p = .955 \) were not statistically significantly related to perceptions of campus family-friendliness. Academic probation \( f = 1, p = .605 \) and number of hours studied \( f = 1, p = .362 \) were not statistically significantly related to perceptions of campus family-friendliness.
Clare O’Brien, Foreign Languages
Faculty Mentors: Jeffrey Sacks, Comparative Literature
Assessing Linguistic and Cultural Literacy Among Saudi Arabian Students

This research project examines the linguistic and cultural literacy of Arabic among Saudi Arabian students. This paper will discuss the general issue of literacy of Arabic in the Arab world and provide examples of various efforts made to eradicate illiteracy among different populations. To test the students’ linguistic and cultural literacy, a survey was distributed to Saudi Arabian international students earning their Bachelor’s and Master’s degrees in seven different universities across the United States. This paper will address the students’ results of selected survey questions and speculate about possible factors influencing students’ answers, though the study’s primary purpose is to demonstrate the presence of the deficiency rather than investigate its actual causes and sources. The results of this study show marked deficiencies in rudimentary linguistic skills and general knowledge of topics of regional importance. These results and their consequent discussion contribute to the current dialogue among scholars and educators in the Arab world about the standards and efficacy of the education system. This study may provide a starting point for future research of linguistic and cultural literacy, especially among the youth of Saudi Arabia and in the Arab world in general, and how literacy rates may be further fostered and improved upon.

Kevin Oda, Biology and Kelly Tran, Biology
Faculty Mentor: Dr. Julia Bailey-Serres, Botany and Plant Sciences
Deciphering Rice Developmental Plasticity in Response to Water

Rice (Oryza sativa L.) provides the majority of calories each day for half of humanity. Due to the growing world’s population and climate change, rice is intensively studied to enhance its production. Our main area of research is to improve the ability of rice to combat abiotic stresses such as flood and drought, which can be improved through processes at the level of metabolism and development. In the laboratory, our goal is to assess different layers of gene regulation of specific cells, such as those of a specific organ (i.e., the root), tissue (i.e., the vasculature) or cell-type (i.e., the phloem companion cells). To achieve this goal, we have established two technologies that allow evaluation of the genes that are regulated in specific cell-types. These techniques include methods that allow isolation of nuclei, where chromosomes are organized and genes are transcribed and the purification of ribosomes, which translate gene transcripts (mRNA) into proteins. These methods are called INTACT (Isolation of Nuclei in TAgged in Specific Cell Types) and TRAP (Translational Ribosome Affinity Purification). A key advantage of both methods is the ability to isolate nuclear DNA and mRNA from specific cell types. Our project has been to develop these technologies for rice. We have taken part in the characterization of gene promoters that express the INTACT and TRAP genes in specific cells and in the development of the transgenic rice lines that will be used for these technologies. The outcome of our research will be genetic material that allow the community of rice researchers to have access to the DNA (epigenome), nuclear RNA (transcriptome) and translated mRNAs (translatome), so that they can better understand processes that allow plants to endure droughts and floods.
Abhinandan Pabla, Cell, Molecular, and Developmental Biology & Neuroscience  
**Faculty Mentor: Martin Riccomagno, Cell Biology & Neuroscience**  
Functional Role of β2Chn in Granule Cell Migration: Understanding the Mechanisms Underlying Cerebellar Development

The adult cerebellum is necessary for postural stability, equilibrium and coordination of voluntary movements. Its development begins with the tangential migration of precursor cerebellar granule cells from the proliferative rhombic lip to form the external granule cell layer (EGL). An important step in this migratory pathway is the transition from tangential to radial migration and the guidance of these granule cells from the external to inner granule cell layer (IGL). *In vivo* and *in vitro* data raise the exciting possibility of a putative role for βChimaerin-dependent EGL to IGL migration. I will explore βChimaerin's functional role during granule cell migration. Our preliminary results fuel our optimism that these experiments will enhance our understanding of cerebellar development.

Eva M. Perez-Cecenas, Business Administration, David Oros, Psychology, and Eugene Vaudry, Psychology  
**Faculty Mentor: Dr. Rebekah A. Richert, Psychology**  
Fantasy Perception as a Measure of Successful Transfer in Children’s Media

Literature has argued children are more likely to apply information from media to other contexts as they age and learn to identify which information is applicable to specific social situations (Richert, Robb, & Smith, 2011). Research has found 3- to 5-year-old children are more likely to claim media characters are pretend than older children (Woolley & Cox, 2007). Therefore, we hypothesize a possible link in the way a child perceives a character and the information learned from the character. Fifty-three children, ages 3 to 7 years old, watched video clips of cartoon characters solving problems and were then asked to solve an analogous real-life version of the problem. Following, children were asked whether they thought the characters were real or pretend. Data analysis will examine the relationship between children’s views that the character is pretend or real and children’s learning from that character. We predict younger children, ages 3 to 4.5, will be more likely to believe a character is real than older children. We also predict that children who believe a character is real will be more likely to correctly solve the analogical problem. If our hypotheses are supported, it can be argued that educational programing that is perceived as real by the child may support an increased likelihood of transferring lessons to a new context for young children.
Author: Nicole J Perez, Psychology & Music  
Faculty Mentor: Dr. Kate Sweeney, Psychology  
University Students Attitudes And Behaviors Towards Cognitive Enhancement Drugs

Cognitive enhancement drugs (CEDs), such as Adderall, have become popular among college students for their ability to enhance focus and productivity. Studies find that illicit usage rates of CEDs range from 16-39% and, unlike other drugs, are openly encouraged in intense academic settings. This study represents an initial effort to identify predictors of attitudes toward CEDs for academic uses in a large West Coast university.

Undergraduate participants completed an online survey measuring demographics, personality, academic habits, and perceptions of caffeine and CED use. We found that agreeable and conscientious students were more permissive towards CED use, and women were more likely than men to differentiate between use of caffeine and CEDs. Furthermore, students involved in campus activities were less permissive and believed that CED use was more common on campus. Finally, students who use caffeine for academic purposes were more permissive and believed that CED use was more common. These findings confirm variability in attitudes toward CEDs and identify predictors to aid in effective interventions.

Rattapol Phandthong, Biochemistry  
Faculty Mentor: Dr. Prue Talbot, Cell Biology & Neuroscience  
Video Bioinformatics Analysis of Electronic Cigarette-Induced Oxidative Stress and Mitochondrial Morphology

Mitochondria functions are strongly correlated to their morphology, membrane potential, and spatial distribution within the cell. Oxidative stress affects mitochondrial health via elevated reactive oxygen species (ROS) that DNA damage, lipid peroxidation, and oxidation of proteins. In this study, the effects of electronic cigarette (ECs) fluid and aerosol on mitochondrial ROS levels and morphology were examined using a mitochondrial-targeted oxidative stress reporter probe, MitoTimer. The colorimeter Timer protein was tagged to the cytochrome c oxidase subunit VIII gene to detect mitochondrial oxidation levels by an irreversible fluorescent shift from green to red. Mouse neural stem cells (mNSCs) were stably transfected to express the MitoTimer reporter and treated for 24 hours with liquids or aerosols generated from various electronic cigarette brands. Time-lapse images of the green and red fluorescence were collected using an inverted Nikon Eclipse microscope at millisecond resolution. CellProfiler image analysis software was used to segment the two channels and determine the ratio of the green to red fluorescence, indicative of ROS levels in the mitochondria. Extracted morphological features were used to classify the mitochondria as fragmented, swollen, or networked using an algorithmic decision tree operating on a Matlab platform. Fluorescence analysis revealed that exposure to 1%, 0.5%, and 0.3% Vuse Menthol and Tobacco liquids resulted in a dose-dependent elevation of oxidation of mitochondrial proteins. Moreover, liquid-treated mitochondria exhibited changes in morphology to more networked and swollen phenotypes. This study reveals that low concentrations of EC exposure can lead to significant oxidative stress and irregularities in mitochondria morphology.
Brandon Phong, Biology
Faculty Mentor: Dr. Alexander Raikhel, Entomology
Genetic Deregulation of Vitellogenesis and its Effects on Aedes Aegypti Reproduction

Understanding the physiology of mosquitoes is extremely vital to identifying how mosquito diseases such as Dengue and malaria are transmitted. Female mosquitoes transmit disease pathogens because they are obligatory blood feeders and vertebrate blood is required for egg development. Upon taking a blood meal, females of *Aedes aegypti* initiate egg maturation process. Vitellogenesis is a central process of egg maturation; it involves production of yolk protein precursors (*YPPs*) by the fat body (an insect analogue of the vertebrate liver) and their subsequent internalization by developing oocytes. The expression of *YPP* genes is activated by an insect steroid hormone, 20-hydroxyecdysone (20E). Furthermore, nuclear receptors (NRs) AaEcR and AaUSP form the heterodimer receptor that binds to 20E to promote expression of *YPP* genes. In the Professor Raikhel laboratory, I plan to study how AaEcR and AaUSP are regulated and how deregulation of these two NRs expression affects egg maturation in *Ae. aegypti*. In my research I will test a hypothesis that the regulation of AaEcR and AaUSP gene expression is essential for the egg maturation. My hypothesis is that inhibiting AaEcR will prematurely end Vitellogenesis resulting in abnormal and underdeveloped eggs. First, I will use quantitative Real Time PCR (qPCR) to study profiles of these NR genes during the reproductive cycle. I will then utilize RNA interference for silencing these genes. The outcomes of this experiment will be examined phenotypically by measuring average follicle size and egg deposition, as well as measuring the transcript abundance of AaEcR and AaUSP.

Geoffrey N. Pronovost, Biochemistry
Faculty Mentors: Andre Obenaus, Pediatrics and Monica Carson, Biomedical Sciences
Virginia Donovan, Biomedical Sciences and Yoshinori Otani, Biomedical Sciences
TREM2 Deficiency Decreases Hemispheric Swelling Following Traumatic Brain Injury without Affecting Astrogliosis or Microgliosis

The consequences of traumatic brain injury (TBI) vary by individual, but include increased risk of Alzheimer’s disease. Microglia are brain-specific macrophages with a primary function of mediating immune responses within the brain, and are distinguished from other macrophage populations by their ~10-fold higher levels of the Triggering Receptor Expressed on Myeloid Cells-2 (TREM2). Three observations highlight the importance of TREM2-dependent microglial functions. (1) Humans completely lacking a functional TREM2 develop early-onset cognitive dementia. (2) Humans carrying a heterozygous mutation in the ligand-binding pocket of TREM2 have a 3-fold higher risk of developing Alzheimer’s disease. (3) TREM2 promotes phagocytosis of cellular debris and amyloid with early studies suggesting it acts as an anti-inflammatory receptor. We initially hypothesized that mice lacking the anti-inflammatory TREM2 receptor would have exacerbated pathology following TBI. Contrary to this prediction, we find that TREM2-deficient mice exhibit a 90% reduction in impacted hemispheric swelling seven days following TBI, compared to WT littermates. We quantified immunoreactive astrogliosis and microgliosis in brain tissues seven days post-TBI from WT and TREM2KO mice, and find no significant differences. Furthermore, mRNA expression of the astrocyte-specific water channel, Aquaporin 4, decreases 50% in TREM2KO mice in both brain hemispheres following TBI; no significant changes in pro-inflammatory cytokine expression are observed. These data reinforce the critical role that TREM2 plays in brain injury responses but also challenge the current paradigm considering TREM2 strictly as anti-inflammatory.
Boi Quach, Bioengineering  
**Faculty Mentor: Kaustabh Ghosh, Bioengineering**  
Harry Scott, Xiao Yang, Soroush Ardekani

**Rho/ROCK Regulates Matrix Stiffening-dependent Endothelial Activation by Suppressing TRPV4**

Vascular endothelial activation resulting from the loss of endothelial nitric oxide (NO), a potent anti-inflammatory factor, is a hallmark of chronic inflammatory conditions such as atherosclerosis and diabetes. These conditions are also marked by stiffening of the sub-endothelial matrix. My lab has recently shown that matrix stiffening promotes endothelial activation by suppressing the activity of mechanosensitive TRPV4 Ca\(^{2+}\) channel, an upstream regulator of endothelial NO. To understand how matrix stiffening suppresses TRPV4 activity and promotes inflammation, I here examined the role of Rho/ROCK, key molecular players of mechanotransduction that can regulate endothelial NO. Synthetic matrices were engineered to recapitulate subendothelial matrix stiffness observed in normal (1000 Pascals; Pa) and inflamed (4000 Pa) vessels. When compared with endothelial cells (ECs) grown on normal matrices, those grown on stiff matrices exhibited a significant decrease in TRPV4 activity and NO production and a concomitant increase in monocyte-EC adhesion. Consistent with our hypothesis, impaired TRPV4/NO levels on stiff matrices correlated with a significant increase in Rho/ROCK activity. Importantly, Rho/ROCK inhibition alone enhanced TRPV4 and NO on stiff matrices while significantly inhibiting them on normal matrices. Further, in line with these findings, Rho/ROCK inhibition suppressed monocyte-EC adhesion on stiff matrices while enhancing it on normal matrices. These differential effects of Rho/ROCK inhibition on monocyte-EC adhesion are mediated by associated changes in TRPV4 activity as co-treatment with TRPV4 antagonist or agonist reversed the effects of Rho/ROCK inhibition. Thus, these findings reveal that suboptimal Rho/ROCK activity contributes to loss of TRPV4-dependent NO production and increased endothelial activation.

Maria D. Ramirez Loyola, Psychology.  
**Faculty Mentor: Kate Sweeney Psychology**

**Influences of Religiosity and Spirituality on Waiting Experiences**

Despite the ubiquity of stressful waiting periods (e.g., after a job interview, diagnostic test, midterm exam), we know little about these waiting experiences or about individual differences in these experiences. Although studies have documented differences in personal waiting experiences, as well as tips for navigating waiting periods, research has not yet investigated the role of religiosity or spirituality in waiting experiences. To examine this question, participants (N = 200) were recruited through Amazon’s Mechanical Turk to complete a questionnaire that included measures of their religious and/or spiritual beliefs. Participants then reflected on their experiences awaiting uncertain news and reported their typical thoughts and feelings during these experiences. Initial findings indicate that people who are more religious and/or spiritual are less likely to engage in information avoidance, more likely to see the silver lining in a bad outcome, and more likely to embrace a hopeful, optimistic attitude during waiting periods. These findings suggest that religious and spiritual beliefs might help people navigate uncertain waiting periods by providing them with a sense of comfort and confidence that everything will eventually work out in the end. A better understanding of the role of religion and spirituality in waiting experiences may reveal opportunities to target interventions appropriately to reduce distress during stressful waiting periods.
Connor Richards, Physics
Faculty Mentor: Owen Long, Physics and Astronomy
Search for All-Hadronic Gluino Decays at the LHC

A search for gluino-mediated pair production of Higgsinos, the superpartner of the Higgs boson, is presented using simulated data from proton-proton collisions at a center-of-mass energy of 13 teraelectronvolts (TeV) in the Compact Muon Solenoid (CMS) Experiment at CERN’s Large Hadron Collider (LHC). The sample is normalized to an integrated luminosity of 20 fb$^{-1}$. This work contributes to the ongoing search for evidence of supersymmetry (SUSY) by studying expected significance and exclusion limits for this model during Run II of the LHC. A multidimensional analysis in kinematic variables and a data-driven background estimation method are used here to find an expected significance of 1.63σ for the case that an excess over standard model processes is observed. In the case where no excess exists, the results are interpreted in terms of the expected 95% confidence level (CL) upper-limit of signal strength and cross-section for this model. While the expected significance is less than 3σ, and therefore not sufficient to claim evidence in the event of an excess, the expected 95% CL on signal strength ($\mu_{UL}$) and cross-section ($\sigma_{UL}^{sig}$) are 0.28 and 9.4 fb, respectively.

Leah Rosario, Political Science
Faculty Mentor: Katja Guenther, Sociology
The Motivational Framework of Trans Activism

I plan to present my preliminary findings on the study of transgender activism on college campuses. These results reveal the motivational framework among for transgender students. Activists experience personal gains from transgender activist involvement, such as having relationships with other transgender activists and/or members of the transgender community, political party affiliation, and emotional resonance. The results from this study reveal knowledge of heterosexism (hetero-normativity, cis-sexism, cisgender privilege) and feeling of community within transgender support groups and organizations as strong motivational factors for involvement in transgender activism. Weak motivational factors include personal gain and political party affiliation. This study also compares and contrasts the differences and similarities of answers provided by participants of various sexual orientations (i.e. gay, lesbian, heterosexual, queer, bisexual) and gender expressions (i.e. transgender, gender nonconforming, gender queer, cisgender). Other factors such as the participant’s academic status (i.e. undergraduate or graduate student), role in transgender activism (i.e. student activist, hired/paid faculty, organization coordinator), and activities led by the research participant (outreach events, informational conferences, film festivals, and support groups), and racial/ethnic backgrounds are also analyzed and presented. My presentation will include excerpts from the interviews I conducted with participants.
Gabriel Ruiz, Statistics
Faculty Mentor: Subir Ghosh, Statistics
An Alternative Estimation of the Logistic Regression Model Parameters

We present an alternative method to the Maximum Likelihood Estimation (MLE) for estimating the parameters of a Logistic Regression model. Most studies include a comparison between several groups whose disease outcome is thought to be different based on one or more varying factors. For more than two groups, maximum likelihood estimates of the parameters are obtained through a numerical solution. In our alternative method, we make use of a closed-form solution which estimates the parameters for two groups. Given a study which has more than two groups, this proposed method estimates the parameters for every possible pair combination between these groups through the closed-form solution. After the truncation of pair combinations that create influential parameter values, we propose that the individual means of the parameter estimates we obtain through every pair combination will give us values that are approximate to the estimates that the MLE method gives for all the groups together. Further, we believe that this method will create parameter estimates for a model that perform well in comparison to the current numerical approach to estimating these same parameters. We illustrate our new approach through a Blood Pressure vs. Heart Disease Risk dataset.

Spencer Salazar, Neuroscience
Faculty Mentor: Dr. B. Glenn Stanley, Cell Biology and Neuroscience
Michelle Calderwood, Psychology Systems Neuro
Morphine-Induced Feeding via Intracranial Injection into the Lateral Septum: Identification of the Neural Substrates

Our laboratory has found that stimulation of opioid receptors in the lateral septum (LS) via intracranial injection of morphine, a µ-opioid receptor agonist, elicits feeding in satiated Sprague Dawley rats. Previous works have found that the LS is indeed connected to regions of the brain associated with feeding, reward and motivation, including the lateral hypothalamus and nucleus accumbens. With this in mind, we were interested in the efferent projections, and possible afferent-efferent networks that may be responsible for the feeding behavior observed in response to µ-opioid receptor stimulation in the LS. We utilized anatomical tract-tracing techniques and immunohistochemical (c-Fos) approaches that label activated neurons. We hypothesized that c-Fos expression would be visible in brain regions sharing direct connections with the lateral septal area, specifically the lateral hypothalamus and the nucleus accumbens. In our preliminary results, we did not find significant differences in c-Fos activation between morphine and control animals in the lateral hypothalamus or nucleus accumbens.
Juan Sanabria, Neuroscience  
**Faculty Mentor:** Dr. Kelly Huffman, Psychology  
Charles Abbott, Neuroscience  
Ethanol effects on P53 mediated inhibition of Id2 expression

Our laboratory has reported that first generation prenatal ethanol exposure (PrEE) mice have an altered positional Id2 gene expression compared to controls (El Shawa, 2013). We hypothesized that this ectopic expression is accompanied by increased RNA transcript density in cortex, and is mediated via an epigenetic mechanism, or through other direct changes. In particular, we believe the expected change in gene expression of Id2, driven via PrEE, is caused by reduced methylation levels of the promoter region of Id2, an epigenetic change to DNA, or changes in Tp53 expression, a direct Id2 suppressor gene. Previous research has shown that a deletion in the p53 gene caused an increase in Id2 expression (Paolella, 2011), suggesting that if modulation of p53 expression causes a change in Id2 expression compared to controls, then this pathway could explain the changes seen in PrEE mice. Presently, RT-qPCR was used to reveal that PrEE alters Id2 expression, but not p53, compared to controls, indicating that p53 expression is not the cause of the mis-regulation of Id2 in PrEE mice. Methylation specific PCR was also used to reveal that methylation levels of the Id2 promoter region were decreased, suggesting that methylation levels of the promoter region of Id2 underlie some of the overexpression of Id2. Future experiments would employ a chromatin immunoprecipitation assay to determine if there is a change in protein/DNA interactions between p53 and Id2 in PrEE mice to further define the pathway that alcohol uses to modulate gene expression of Id2.

Anna Sanchez, Sociology/Law and Society  
**Faculty Mentor:** Dr. Tanya N. Nieri, Sociology  
Extent of and Barriers to Campus Involvement among Student-Parent Undergraduates at UCR

Campus involvement is a very important aspect of a student’s life in higher education. Students involved on campus have higher satisfaction with their higher education experience and have a greater sense of belonging to their campus. Although campus involvement is beneficial to students, it is not easily obtainable by all students. Student-parents have to balance their student and parental responsibilities while trying to connect with their campus. Lack of time, childcare, and financial resources are barriers to campus involvement among student-parents. There has been limited research on the student-parent population and even less research on their campus involvement in a university setting. This study assesses the level of student-parents’ campus involvement by analyzing results from a University of California Riverside student-parent needs assessment survey that my research team and I conducted in the Spring 2013. The sample included 67 undergraduate student-parents. This study measured campus involvement by assessing student-parents involvement in academic events, social events, and student-parent organizations. Results were that 34% of student-parents participated in academic events, 34% participated in social events, and 33% participated in student-parent organizations at UCR. Among barriers to campus involvement, caring for their children was the most common, identified by 98% of the sample, followed by cost (75%), job (68%), transportation (56%), and caring for other family members (47%). This study contributes to the limited literature on student-parents in higher education.
Chirawat Sanpakit, Mechanical Engineering
Faculty Mentor: Dr. Marko Princevac, Mechanical Engineering
Laboratory Fire Behavior Measurements of Chaparral Crown Fire

In 2013, there was an estimate of 9,907 wildland fires that claimed 577,675 acres of land. That same year, about 542 prescribed fires were used to treat 48,554 acres by several agencies in California. Being able to understand fires using laboratory models can better prepare individuals to combat or use fires. Our research focuses on Chaparral Crown Fires. Chaparral is a shrub, elevated about 1 foot off the ground that blankets 5% of California land. As a result, they become key fuel sources for wildfires. By using chaparral to model crown fires, our goal is to develop a model that can be deployed for evacuation planning or firefighting in the event of these fires. Laboratory experiments were conducted at the USDA Forest Service Pacific Southwest Research Station. We utilized a wind tunnel equipped with cameras for visualization, arrays of thermocouples, and an in-house developed Matlab script to analyze experiments. By controlling the wind tunnel velocity, fuel moisture content, and fuel geometry, we have quantified the fires by their flame heights, flame velocities and fuel consumption rates. Experiments were conducted inside the wind tunnel, with a raised platform to model crown fires. Results shows wind velocity significantly enhances fire intensity and creates a far more destructive flame relative to one without wind. Also, depending on combination of other variables, torching, incomplete burns, and spotting were observed in our experiments. Finally, results were used to validate a Computational Fluid Dynamics (CFD) program that simulates fires.

Bijan Sasaninia, Microbiology
Faculty Mentor: Eugene A. Nothnagel, Botany and Plant Science
Martha Orozco-Cardenas, Director of Plant Transformation Research Center
Rojin Ghobadi, Zachary Cryder, Saba Wube, Gabriel Juloya, Brooke Weston, Seung Seo, Jiha Lee, Adrian Pardo
Organ Localization of a Methylated Cell Wall Sugar in Transgenic Tobacco Expressing a Moss Methyltransferase Gene

Certain methylated cell wall sugars are present in relictual plants but are scarce or absent in angiosperms and are thus of interest in evolutionary biology. Methylated sugar residues are also relevant to biofuel production because they can yield more synthetic diesel fuel by thermochemical conversion than can corresponding unmethylated sugars. Previous research in the laboratory has shown that transgenic expression of a Physcomitrella patens methyltransferase gene, MT1, in Nicotiana tabacum cv Xanthi causes synthesis of 3-O-methyl-galactosyl (3-O-Me-Gal) residues, a methylated cell wall sugar not found in wild-type tobacco. Because the constitutive, high-level cauliflower mosaic virus 35S promoter was used to drive the transcription of MT1, the hypothesis is that 3-O-Me-Gal will be expressed in all organs of the transgenic tobacco. To test this hypothesis, alcohol insoluble residue (AIR), a crude cell wall-enriched fraction, was prepared from leaf, stem, root, and flower of three different transgenic MT1 tobacco plants. These AIR preparations underwent methanolysis, derivatization, and gas chromatography-mass spectroscopy for analysis of glycosyl composition, including 3-O-Me-Gal. The results were consistent across the three plants with the 3-O-Me-Gal content averaging 1.62, 1.24, 0.81, and 0.47 mol% for leaf, flower, root, and stem, respectively. Ongoing research aims to determine where 3-O-Me-Gal is localized within the leaf cell wall, i.e., whether in the pectin, hemicellulose, or cellulose subtraction. This research was supported by CNAS HSI-STEM Undergraduate Research Program and by USDA NIFA grant 2008-35318-04599.
Priyanka Singh, Chemical Engineering  
Faculty Mentor: Dr. Kawai Tam, Chemical and Environmental Engineering  
Alyssa Yan, Chemical Engineering  
Anna Almario, Chemical Engineering  
Effect of NOx-Out Device on Fuel Consumption and Differential Pressure of Small Off-Road Engines

Gasoline-powered small off-road engines (SOREs) contribute up to 20 percent of harmful pollution in many U.S. metropolitan cities because these engines are not as stringently regulated as automobiles. Currently, there are no affordable emission control devices for SOREs available on the market. To address this health and environmental issue, NOx-Out was designed to reduce pollutants, such as nitrogen oxides (NOx), volatile organic compounds (VOCs), carbon monoxide (CO) and particulate matter (PM) from SOREs using Selective Catalytic Reduction (SCR) technology. NOx-Out is a muffler-like device consisting of 1) mesh filter that captures PM; 2) SCR system with urea injection and copper zeolite catalyst coated on a honeycomb cordierite structure that converts pollutants to harmless chemicals; and 3) fiberglass absorption muffler that reduces engine noise. Before NOx-Out can be commercialized, the effects of the device on engine performance, whether it caused significant backpressure or changed fuel consumption, were determined. NOx-Out was tested on Generac GP 3300 portable generator under varying power loads. At the highest load of 3 kW, NOx-Out contributed 6.25 kPa of backpressure, which is comparable to standard stock mufflers and is also well below the 40-kPa maximum allowable backpressure for engines less than 50 kW. In addition, the generator only used an average of 2.24 percent more gasoline and emitted an average of 6.24 percent more CO2 with functional NOx-Out attached. These findings demonstrate that implementing NOx-Out on SOREs will not harm the engine or significantly increase fuel usage. Therefore, NOx-Out is safe and economical for consumers to use.

Keely Smith, Foreign Languages  
Faculty Mentor: Yang Ye, Comparative Literature  
The “Three Teachings” in Chinese poetry: Reading Wang Wei and Li Bo

History indicates that poetry informs its readers of not only the influences that affected society, but also events and emotions that a poet experienced. As seen in ancient Chinese poetry, at times people expressed these realities through art forms, either stating or implying their purpose in doing so. This may have occurred even if the relayed message differs from the society in which an individual resides. For example, Wang Wei and Li Bo wrote poetry that reflect the influences of Buddhism and Daoism respectively, even though they were both living in a Confucian society during the Tang Dynasty. This demonstrates what philosophies (and what aspects of these philosophies) these poets valued most as they wrote their poetry in isolation from their political obligations. Through the use of translated poems and historical knowledge, I will conduct a close-reading of the works of both poets and identify the implications of the influences of Buddhism and Daoism. By observing these implications, I will demonstrate how these philosophies affected these poets in their view of life and how they identify with nature as they describe it. Dr. Yang Ye, the Associate Professor in the department of Chinese/Civilizations/Comparative Literature, whose research addresses the use of literary elements in Chinese literature, will advise my thesis. His mentorship will guide me in furthering and guiding my understanding of the relevance of these philosophies within Wang Wei and Li Bo’s poetry.
**Allie SteinerLund, Biology**  
**Faculty Mentor: Richard Cardullo, Biology**  
**Kimberly Stephens, Entomology**  

Utilizing qPCR to Determine Expression Levels of *par2*-like Sequences Thought to Play a Role in Sperm Motility of Mosquitos

The motility of sperm from the mosquito, *Culex pipiens* is hypothesized to be regulated through a cell-signaling pathway induced by a protease-activated receptor 2 (PAR2)-like protein located on the flagellar membrane by a trypsin-like activator from male accessory glands (Thaler et al., 2013 *Biol. Reprod.* 89:135). Several *par2*-like sequences, Neuropeptide Y (*npy*), Somatostatin Receptor (*ssr*), Cardioacceleratory Peptide Receptor (*ccap*), G-Protein Coupled Receptor (*gpcr*), and Drosophila Homologue (*dh*), have been identified in the proteome and genome of *Culex pipiens* using ncbi BLAST and are believed to code for PAR2-like proteins. To determine whether or not these PAR2-like proteins play a role in sperm motility, the level of gene expression of each *par2*-like sequence was examined using qPCR. Transcription levels of each *par2*-like sequence have been or are currently being analyzed. To date, it has been determined that *ssr*, *gpcr*, and *npy* are transcribed in the testes of the male mosquitos, but at varying degrees. *ssr* and *gpcr* were detected at lower cycle numbers than *npy*, indicating that the *ssr* and *gpcr* sequences are transcribed at higher levels than the *npy* sequence. *ccap* and *dh* sequence levels are still being tested. High expression levels of these *par2*-like sequences suggest potential targets for genome editing strategies to disrupt a critical signaling pathway necessary for sperm activation and fertilization.

**Glenna Stomackin, Biology**  
**Faculty Mentor: Joel Sachs, Biology**  

Effects of Early Processes on *Lotus japonicus*

Legumes account for more than a quarter of the world’s agricultural crop production. They are involved in an important symbiotic relationship with bacteria, called rhizobia, which reside in the soil and nodulate the legume roots to fix nitrogen for the plant. These beneficial bacteria can be added to the soil when legumes are planted as a food crop, yet are at times outcompeted by the native bacteria already living in the soil. This experiment focuses on the competition aspect of the legume-rhizobia relationship, as well as exploring methods of growing seedlings to optimize plant fitness. There are four treatment groups used to determine maximum plant fitness, which was measured by pod production and plant leaf counts. These treatment groups consist of seeds germinated and grown only in water, with nitrogen fertilizer, with trace elements, and with both nitrogen and trace elements. We also look at how these treatment groups affect the ability of rhizobia to nodulate the plant roots when competing against native bacteria. We collected and added soil filtrate from the UCR hills, which contain an array of native bacteria to the plants, as well as a beneficial rhizobium strain, to examine if any treatment group had a significant effect on the nodulation rate.
Marsha Tanare, Psychology & Jennifer Hernandez, Psychology  
Faculty Mentor: Rebekah Richert, Psychology  
Age and Gender Differences in Anthropomorphizing

Children are exposed to religion from an early age (Lane, Wellman, & Evans, 2010). Young children assign human-like qualities to God, using their knowledge of proximal figures (e.g., parents) and applying it to understand religious phenomena. This is anthropomorphization (Davies, 2010). As they age, children anthropomorphize less as their religious understanding becomes more abstract (Barrett, Richert, & Driesenga, 2001). According to past research, anthropomorphizing is seen in children by 3 years of age (Lane et al., 2010). The current study examines when trends of anthropomorphism in childhood start to decline and whether gender differences exist. Boys \( (n = 74) \) and girls \( (n = 114) \) from Muslim, Protestant, Catholic, and non-affiliated religious backgrounds were interviewed regarding their understanding of God’s biological, psychological, and physical capabilities. Children were 3.5- to 6.0-years-old \( (M = 4.71, SD = 0.86) \). Children answered whether or not God had behaviors and emotions resembling human traits; children answered on a five-point scale (No-Really Sure \([-2]\) to Yes-Really Sure \([+2]\)). Few researchers have focused on differentiating anthropomorphic attributions made among young boys and girls. The current study explores whether there are variations in anthropomorphism among boys and girls as they age. Analyses indicated that male and female children were significantly different when anthropomorphizing. Girls \( (M = 0.38, SD = 0.97) \) anthropomorphized more than boys \( (M = -0.002, SD = .90) \), \( t(186) = 2.69, p < .05 \). Additionally, age and anthropomorphization were significantly, negatively correlated, \( r = -.429, p < .05 \). Older children anthropomorphized less than younger children.

Katayoun (Kathy) Tehrani, Psychology  
Faculty Mentor: Dr. Kate Sweeny, Psychology  
Nonverbal cues and Person Perception in an Uncertain Situation

This study explored the way people present themselves when discussing a personal performance, in response to often-uncomfortable questions like, “So, how do you think you did?” Specifically, we examined the impressions that expressions of optimism or pessimism, eye contact, and body language make during these conversations. The study proceeded in two phases: (1) an initial interaction phase in which participants \( (targets) \) took an academic test and then conversed with a researcher about their performance, and (2) a peer rating phase in which new participants \( (raters) \) watched videos of the initial interactions and indicated their impressions of the targets from the initial phase. We hypothesized that targets who were more optimistic, made more eye contact, and had more open body language would be rated more positively than targets who were more pessimistic, made less eye contact, and had more closed body language. Correlational analyses examining relationships between nonverbal behavior and raters’ perceptions consistently supported our hypotheses. Our findings suggest that people are inclined to present themselves in subtle ways that promote socially belonging and maintain positive social connections.
Rachel Tennell, African American Studies  
Faculty Mentor: Nick Mitchell, Ethnic Studies  
Student Debt and its Relationship to Diversity

My research will be looking at the ways undergraduate’s relationship to student debt and diversity play a role at the University of California Riverside (UCR). Specifically, I would like to research if the relationship that students have to student debt hurts diversity, helps diversity, or whether it does not affect it at all. I am interested in knowing if student debt affects diversity for future generations, as well as present. What changes to diversity will be made as student debt increases year by year. The University of California Riverside is “known” for being a diverse campus, but if the student debt crisis increases every year, how will that effect the undergraduates that attend? Will it stifle the reputation of diversity that the university holds? In order to conduct this research I have looked into different academic scholar’s work on the theories of oppression, the relationship that creditors have to debtors, as well as the history of debt in the university and it’s growth. Overall, I am anticipating that my research will prove that although student debt depends on diversity, student debt is actually destructive to cultivating a positive reputation of diversity on the campus of UCR.

Yueran Tian, Comparative Literature  
Faculty Mentor: Prof. Heidi Brevik-Zender, Comparative Literature  
The Mobile Gaze in Gorge Sand’s Indiana: Modern Women’s Consciousness

The ability to see in movement is one of the key components of modern experience. This essay compares and contrasts two female figures, Indiana and Noun, in George Sand’s first novel, Indiana, to analyze the way in which the author creates a fluid and affective modern women’s consciousness. The female protagonist, Indiana, becomes a flâneuse because of her power to initiate the gaze, while her maid, Noun, loses her agency because she only comes into being as a reflection of Indiana through the male gaze. Moreover, Indiana’s ability to associate her perceptions with her affective emotions, including distress and anguish, also permits her inner self to be made visible. Physical mobility, therefore, not only enables the heroine to wander in the city without gender limits, but also reveals her interior reality.
Brandon Tran, Psychology  
**Faculty Mentor:** Kate Sweeney, Psychology  
Pronoun Usage by Doctors and Patients in Surgical Consultations

Good communication between doctors and patients facilitates patients’ adherence to treatment, recovery, well-being, and overall satisfaction with their provider (Zolnierek & DiMatteo, 2009). Interactions require a partnership between the doctor and patient, each expressing and evaluating their goals to effectively create a plan of action through shared decision making (Charles et al., 1999). In conversation, the usage of pronouns has been found to represent attentional focus, whether it be on the self as with first-person singular personal pronouns (I/me) or others as with first-person plural personal pronouns (we/us) or second-person pronouns (you; Zimmermann et al., 2013). Differences in pronoun usage within conversations have also been shown to indicate social status, with “other-focused” individuals using more second-person pronouns in comparison to “self-focused” individuals (Ickes et al., 1986; Kacewicz et al., 2014). The current study seeks to investigate whether differences in pronoun usage between doctors (other-focused) and patients (self-focused) relate to the outcomes of healthcare consultations. Doctor-patient conversations were recorded and transcribed into text files, then separated to isolate doctor language usage and patient language usage. The text files were analyzed by a word counting program (Linguistic Inquiry and Word Count, or LIWC; Pennebaker et al., 2007) to identify and categorize specific word usage of patients and doctors. Findings confirmed that patients used more singular personal pronouns and doctors more plural personal and second-person pronouns, and pronoun use predicted both patients’ and doctors’ experience during the consultation (e.g., satisfaction, emotional state).

Claire Tran, Bioengineering  
**Faculty Mentor:** Dr. Elisa Franco, Mechanical Engineering  
Jonathan Lloyd, Bioengineering  
Designing an *in vitro* Bistable Biological Circuit using RNA Aptamers

Synthetic biomolecular circuits promise to advance our ability to redesign and improve cellular functions as well as developing cures for diseases. A network of synthetic circuits can be built using a variety of small biochemical modules that regulate one another, mimicking well understood functions in engineered systems, such as bistability. Bistable systems switch between two stable states, and they are crucial regulators in large networks because they can determine the activity of downstream systems. The proposed design is an *in vitro* bistable circuit using ribonucleic acid (RNA) aptamers. Our design consists of two subsystems, which rely on the process of transcription performed by two distinct bacteriophage RNA polymerases. Each enzyme transcribes an RNA aptamer, which inhibits the activity of the other enzyme, by direct binding to the enzyme transcription domains. Inhibition is made reversible by strand displacement, which consists of DNA “reactivating” strands that are designed to bind to the aptamers and reactivate the enzymes. Mathematically, we have modeled the system to validate whether it achieves bistability. Experimentally, we have characterized the inhibition and reactivation of the RNA polymerase enzymes by using fluorimetry and gel electrophoresis techniques. When compared to other bistable circuit designs, this circuit minimizes the components involved and its RNA components are easier to engineer than proteins typically used to create regulatory pathways in synthetic biology. RNA aptamers have been shown to work well *in vivo*, thus allowing for my design to potentially work inside a cell.
Raymond-Tan Tran, Neuroscience
Faculty Mentor: Michael E. Adams
Title: Relative expression of Ecdysis Triggering Hormone (ETH) Transcript and Receptor Subtypes A and B in Adult *Drosophila melanogaster*

Hormones are important regulators of development, physiological state, and behavior in all animals. In insects, Ecdysis Triggering Hormone (ETH), secreted by endocrine Inka cells, signals the end of each molt by initiating a behavioral sequence necessary for shedding of the cuticle. Inka cells and ETH persist into the adult stage, raising questions about its post-development signaling functions. Though their existence has been well accepted, little studies actually documented their presence in *Drosophila melanogaster*. The purpose of this study was to determine relative expression levels of ecdysis triggering hormone (ETH) and ecdysis triggering hormone receptor (ETHR) subtypes A and B in virgin and mated male and female fruit flies (*Drosophila melanogaster*) at specific developmental stages in adults. Virgin flies were collected at several time points relative to eclosion: day -2, day -1, day 0, day 3, day 5, day 8, and day 10. Mated flies were mated on day 4, then collected on day 5. Using reverse transcriptase polymerase chain reaction (RT-PCR), varying amounts of ETH, ETHR-A, and ETHR-B precursor transcript were found in each group of flies. These results suggest that ETH, ETHR-A, and ETHR-B may play an important and different role in adult male and female insects. Future studies will document Inka cells through fluorescence microscopy in pre- and post-copulation male and female *Drosophila melanogaster*.

Christian Turner, Cell, Molecular and Developmental Biology
Faculty Mentor: Morris Maduro, Biology
Title: Evolution of the GATA Family of Transcription Factors in Nematodes

The GATA family of transcription factors is a group of regulatory proteins found throughout many organisms, from fungi to humans. These factors occupy key roles in the early development of embryos in vertebrates and invertebrates, and are required for cells to adopt the correct lineage fates and maintain tissue identity throughout the adult lifespan. The robustness of GATA factor function correlates to the well conserved nature the GATA transcription factor family across evolutionary time. Vertebrates contain only six members, unlike other transcription factor families, which are greatly expanded. The GATA family in the nematode *C. elegans* is slightly expanded from the six found in vertebrates to eleven. Here we use the eleven GATA factors of *C. elegans* as a baseline for the exploration of GATA factor evolution in nine other species of the *Caenorhabditis* genus, including *C. angaria*, *C. species1*, and *C. plicata* species significantly evolutionarily diverged from *C. elegans*. Using computational analysis, we seek to unambiguously define each of the eleven GATA transcription factors across these nine species of *Caenorhabditis* in order to examine the evolutionary robustness of this gene family among species both closely and distantly related to *C. elegans*. Through this analysis we elucidate novel insights to the evolution of this gene family in *Caenorhabditis* and other nematodes. This includes identification of apparent conserved regions found outside of the DNA-binding domains.
Erika Varady, Biology  
Faculty Mentor: ALN Rao, Plant Pathology and Microbiology  
Heterologous Replicase Driven 3’ End Repair of Cucumber mosaic virus Satellite RNA

To investigate the extent of the 3’ end repair in a satellite RNA of Cucumber mosaic virus (CMV) strain Q (Qsat) by a heterologous Tomato aspermy virus (TAV), a set of biologically active agrotransformants corresponding to the three genomic RNAs of TAV was developed. Analysis of Nicotiana benthamiana plants agroinfiltrated with TAV and either wild type or each of the six 3’ deletion mutants of Qsat revealed that (i) heterologous replicase failed to generate Qsat multimers, a hallmark feature of homologous replicase dependent replication of Qsat; (ii) manifestation of severe symptom phenotypes and progeny analysis suggested that heterologous replicase was competent to repair Qsat deletion mutants lacking up to 3’13 nucleotides (nt) but not beyond and (iii) comparative in silico analysis indicated that the 3’ secondary structural features of the repaired Qsat progeny from heterologous vs homologous driven replicases are remarkably very similar. The significance of these observations is discussed.

Author: Krystal Vasquez, Chemistry  
Faculty Mentor: Dr. James O. Sickman, Environmental Science  
Relationship Between the Trajectory of Mid-latitude Cyclones in the Eastern Pacific Ocean and the Isotopic Composition of Snowfall in the Sierra Nevada

Understanding past and future variations in the Sierra Nevada snowpack is crucial in order to plan future water management. Of particular importance would be an archive of past snowfall variability, which can be recorded through isotopic records found in local paleoproxies (e.g. diatoms). We proposed to quantify the relationship between sources of Sierra Nevada precipitation events and the isotopic composition of its snowpack in order to uncover if isotopic variations recorded in these archives could serve as reliable indicators of past atmospheric moisture sources. Analysis conducted during Winter 2012-13 of individual storm events occurring in Lodgepole, CA (Southern Sierra Nevada) showed a statistically significant correlation between the isotopic composition of the snowfall and the storm track trajectory ($R^2 = 0.8027$). This promising find indicated that there was climatic significance in the isotopic analysis of proxies of the area. However, archived samples from calendar years 2007-2008 obtained from the National Atmospheric Deposition Program (NADP) contrasted our previous findings and showed no significant correlation between the variables. We believe however that may not be due to a lack of statistical relationship, but rather caused by the method of collection which incorporated several storm events into a single sample. Furthermore, the variations of sea surface temperature (SST) caused by Pacific circulation events that took place in 2007-2008 could have also created some error.
Nicholas Ventura, Cell, Molecular and Developmental Biology  
Faculty Mentor: Nicole I. zur Nieden, Cell Biology and Neuroscience  
Devon D. Ehnes, Dorota Kaniowska¹  
¹Translational Center for Regenerative Medicine, University of Leipzig, Leipzig, Germany  
Novel MicroRNAs Potentially Enhance Osteogenesis in Hyperglycemic mESCs

In 2012, the International Diabetes Federation estimated that 382 million people live with hyperglycemia or high blood-glucose concentration, better recognized as diabetes. The Federation expects those numbers to increase emphatically in coming years. Hyperglycemia poses a great threat to bone sustainability and regeneration, and in many cases may lead to serious osteo-degenerative diseases, like osteoporosis. The cellular and molecular mechanisms behind the malfunctions of hyperglycemic cells as they develop into bone are yet to be completely understood. We use mouse embryonic stem cells (ESCs) cultured in hyperglycemia in vitro to model reduced bone formation in a diabetic patient. In these cultures, a paralleled suppression of microRNA-377 and 28 is exhibited with reduced matrix calcification. We have previously identified AMP-activated protein kinase (AMPK), a crucial metabolic protein kinase that is activated by many cellular stresses, as a direct target for these two microRNAs. Here, by using AMPK constitutively-active, AMPK dominant-negative and wild type ESC lines and manipulating microRNA expression levels via transfection, we analyzed AMPK's role in delineating cell fate during early bone differentiation and subsequent phenotypic calcification of the extracellular matrix. By extension, our data will ultimately provide novel insight into the molecular regulation of bone generation in diabetic patients.

Anthony Victoria, History  
Faculty Mentor: V.P. Franklin, History  
Fighting for Inclusion: The Chicano Experience at the University of California

Students at the University of California (UC) during the 1960s were involved in various demonstrations that questioned the structure of the public institution and advocated for liberties such as free speech on campus, improved employment practices for minority faculty, and social equality for all people in higher education. For Chicanos, the latter was most important. For the first part of the Twentieth Century, the Mexican-American plight in the United States was largely ignored. In hindsight, the experiences of Mexican-American youth in the American Southwest culminated during the Civil Rights Era through the creation of the Chicano Movement. El Movimiento—in similar fashion to the Black Power Movement—demonstrated that young Chicano men and women at higher education institutions searched for self-identity, equal rights, and economic justice. This work will provide context on the academic practices utilized by educators that marginalized and stigmatized Mexican children during the pre-Brown era of public education and explain why such experiences served as a catalyst for the creation of a Chicano nationalist and international movement. Moreover, this essay will analyze the creation of El Plan de Santa Barbara and the Lumumba-Zapata college experiment at UC San Diego campuses during the late 1960s and early 1970s to explain how those movements continued to have an impact at the University of California well into the modern era.
Gurjot Walia, Biology
Faculty Mentor: Dr. Emma Simmons, Biomedicine
Hand Hygiene: Effects of Hand Washing vs. Hand Sanitizing

Every year, over 720,000 patients nationwide receive infections from the hospital setting, and of those, approximately 75,000 patients die. The cornerstone of the prevention and control of the spread of these infections is good hand hygiene of hospital staff. These infections lead to unnecessary hospital stays, added costs, further illness, and even death. This issue has led to studies internationally, ranging from the importance of hand hygiene in hospitals to the effectiveness of hand sanitizing versus hand washing in Tanzania where water is scarce, which is critical considering the current drought conditions in California. The most effective method of hand hygiene overall is assumed to be hand washing with warm water and soap, although it seems to be a less preferred method in hospitals today. Thus, a study is needed to confirm which of the two hand hygiene methods, hand washing or hand sanitizing, is most effective in the removal of bacteria. This study will examine nurses in the ACCU (Adult Critical Care Unit) employing one of the methods of hand hygiene before entering and after exiting each patient’s room. Once each nurse exits the patient’s room, the volunteer will swab the nurse’s hands. Two swabs will be collected for each nurse, one after hand washing and another after hand sanitizing. The swabs will then be cultured to determine the presence and amount of bacteria. The hand hygiene method that results with the least number of bacteria present will be determined to be the most effective.

Marjorie Wimmer, Biological Sciences
Faculty Mentor: Dr. Cheryl Y. Hayashi, Biology
Comparison of Sticky Silk Glands in Hatchling and Adult Uloborus diversus Spiders

Spiders are masters at using different types of silks to intercept, slow, and wrap prey. How do spiderlings achieve this mastery? Young spiders do not produce the same set of silks as their adult counterparts; instead, the number of silk types used by a spider increases as they develop. Each kind of silk is produced in a specific silk gland type inside the spider’s abdomen, and the ontogeny of silk production is poorly understood. Here, we focus on sticky silk production in Uloborus diversus, the feather-legged spider. Sticky silks are a critical part of many spider prey capture strategies. Despite its importance, there are many mysteries about the developmental and evolutionary origins of sticky silk. U. diversus uses cribellate silk, which is a Velcro-like, dry adhesive. Hatchling U. diversus build webs with similar geometries to adult prey-capture webs but lack cribellate silk. In our study, we conduct microscopic examination of U. diversus hatchlings and adults to compare their functional silk glands. We fix and section entire spiders at different developmental stages and visualize their tissues with histological stains. In hatchlings, we find at least two types of silk glands, neither of which are cribellate silk glands. We also find that the morphological structures necessary for extruding and combing cribellate silk into Velcro-like fibrils are absent. Our results indicate that cribellate silk producing glands and processing structures develop after and separately from other types of glands, suggesting that cribellate glands either develop independently or derive from the pre-existing gland types.
Jacqueline Wong  
Faculty Mentor: Tim Labor  
**A Stray Princess: Composing Music for a Fantasy Story Containing a Prominent Female Hero.**

The motivation for this project stemmed from my belief that well-rounded female heroes are essential for the development of young female audiences. To emphasize this importance, I wrote a short original fantasy story entitled *A Stray Princess* to demonstrate how Aika, a female hero, can serve as a source of empowerment. With the recent trend of commercial entertainment that adapts Young Adult Fantasy novels into movies, I also wanted to explore the process of creating commercially styled music for these adaptations, which would enhance the theme and emotions of the story. As a result, I wrote three short music compositions to represent Aika’s character development and her world. Through these creative works, I fundamentally wanted to better understand the techniques of making commercial music based on fantasy literature. By creating a work that centers on a female hero, I also wanted to contribute material that supports the importance of young female audiences participating, enjoying, and being represented through this medium of commercial entertainment.

Tiffany Wong, Psychology, Julieanne Ong, Psychology, and David Shoup, Psychology  
Faculty Mentor: Aaron R. Seitz, Psychology  
**Jennifer Crawford**  
**Pattern Classification of EEG Signals during Visual Statistical Learning**

Visual statistical learning (VSL) is a cognitive process that involves learning probabilistic relationships between stimuli and can be used to understand other learning processes. There is evidence that statistical learning might comprise multiple cognitive processes rather than a unitary process as is often assumed. To better understand these processes, this study uses pattern classification techniques with electroencephalography (EEG) to distinguish neural activity during the acquisition of VSL. While recording EEG, we exposed participants to a stream of shapes which were grouped into pairs, and then tested for VSL using a reaction time based search task. A k-Nearest Neighbors (KNN) algorithm was then used to classify the EEG during periods of activity based on the presentation probabilities of the stimuli, and periods of activity based on whether the stimuli displayed patterns of “learned” or “non-learned” behavior in the search task. We show that learned and non-learned patterns can be distinguished within a participant’s EEG by the KNN classifier. With the success of this classification, the cognitive and neural features of statistical learning can be better deconstructed.
Alyssa Yan, Environmental Engineering
Faculty Mentor: Dr. Kawai Tam, Chemical and Environmental Engineering
NOx-Out: Selective Catalytic Reduction Technology for Small Off-Road Engines

According to the U.S. Environmental Protection Agency (EPA), emissions from operating gasoline lawnmowers for one hour are equivalent to the emissions produced by a single car driven for 45 miles. Although the automobile industry has provided a device for largely reducing emissions from commercial vehicles, a product has yet to be developed and commercialized for small off-road engines (SOREs). Currently the NOx-Out design is focused on lawn mowers, which can emit up to 25% raw unburned fuel and produce large amounts of nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compounds (VOCs), and particulate matter (PM)\textsuperscript{[1]}. The NOx-out device utilizes a stainless steel PM filter and Selective Catalytic Reduction (SCR) technology to reduce harmful pollutants into non-hazardous nitrogen and water compounds at low concentrations. Our previous research has shown a reduction of NOx, CO, and PM emissions from a traditional gasoline powered lawn mower by 67%, 87%, and 44% respectively. Our goal is to improve our SCR system within the NOx-Out device by promoting successful exchange rates between NOx, CO, and urea with our copper-zeolite (Cu-ZSM5) SCR technology. We have successfully synthesized a Cu-ZSM5 catalyst with two ion exchanges onto our honeycomb cordierite. The two ion exchange Cu-ZSM5 catalyst will be applied to the NOx-Out device and tested for its ability to successfully reduce NOx and CO with urea.
**Presentation Winners**

**Best Oral Presentation(s)**

**Alexis Dennis, English**  
**Faculty Mentor: Dr. John Ganim, English**  
The Repurposing of Childhood Memory in the Creation of Identity in Sylvia Plath’s Fictive and Non-Fictive Literature

Sylvia Plath, one of the most notable writers of the twentieth century, is often discussed in comparison with other contemporary writers who prompted the literary movement that concerned itself with the exploration of the self through confessional writing. Plath’s fragmented notions of self that emerge as a result of her personal contentions with the larger social milieu of the twentieth century are apparent in her works, as she attempts to create her identity as a woman author in an androcentric culture. Plath’s desire to provide her reader with fictive characters briccolaged with fragmented and doctored childhood memories reflect her own attempts to bricolage her identity, suggesting the importance for the contemporary and modern writer to utilize writing as a means of creating identity through self-expression. Plath not only attempts to create her identity as a woman author in an androcentric culture through her fictive writings that are inspired by her personal experiences, but she utilizes her writings to explore multiple facets of the individual identity, including social identity, familial identity as linked to the domestic space, national identity, and her sexual identity as a woman author. This paper seeks to demonstrate and discuss how Plath bricolages and repurposes her previously repressed childhood memories within the fictive space to provide commentary on each of these four facets of individual identity, and ultimately to challenge the notion of the larger collective bricolage.

**Marissa Gionet-Gonzales, Bioengineering**  
**Faculty Mentor: Dr. Wenwan Zhong, Chemistry**  
Fabrication of Silica Nanofibers for Nucleic Acid Extraction

DNA extraction is a vital technique in biology often used in the diagnosis of diseases, and DNA and RNA research. Commercially available silica coated iron oxide beads are able to extract as low as 1 fmol of DNA. However silica nanofibers should better extract DNA because of their larger surface area. Silica fibers are also cheaper to produce than the silica beads, making them more economical as well as extraction efficient. In this research, silica nanofibers 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. After electrospinning, the fibers were calcinated to remove solvents and PVA. These fibers were then used in DNA extraction from .5 mL of solution. After eluting the extracted DNA from the fibers and amplification by polymerase chain reaction (PCR), gel electrophoresis showed that the DNA from the HCl reacted 2:1 ratio silica fibers demonstrated a more distinctive band in the gel than the silica beads and other fibers at 2 pM (3.3 fmol). This indicates that these fibers recovered a higher concentration of DNA and proves that silica nanofibers are more efficient both extraction and cost wise. The use of silica fibers in DNA and RNA extraction can potentially increase detection of disease and lower the cost and time of biological and medical research that rely on extraction.
BEST POSTER PRESENTATION(S)

Tiffany Wong, Psychology, Julieanne Ong, Psychology, and David Shoup, Psychology
Faculty Mentor: Aaron R. Seitz, Psychology
Jennifer Crawford
Pattern Classification of EEG Signals during Visual Statistical Learning

Visual statistical learning (VSL) is a cognitive process that involves learning probabilistic relationships between stimuli and can be used to understand other learning processes. There is evidence that statistical learning might comprise multiple cognitive processes rather than a unitary process as is often assumed. To better understand these processes, this study uses pattern classification techniques with electroencephalography (EEG) to distinguish neural activity during the acquisition of VSL. While recording EEG, we exposed participants to a stream of shapes which were grouped into pairs, and then tested for VSL using a reaction time based search task. A k-Nearest Neighbors (KNN) algorithm was then used to classify the EEG during periods of activity based on the presentation probabilities of the stimuli, and periods of activity based on whether the stimuli displayed patterns of “learned” or “non-learned” behavior in the search task. We show that learned and non-learned patterns can be distinguished within a participant’s EEG by the KNN classifier. With the success

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**CLASSIFYING EEG PATTERNS OF VISUAL LEARNING PROCESSES**

**Introduction**

Pattern Classification of EEG Signals during Visual Statistical Learning

**Methods**

- 12 UCLA Undergraduate students
- 5 different stimulus pairs
- 2 visual-失效性 tasks with 10 novel shapes
- 10 block-exposure task, shapes randomly grouped into 7 pairs
- 5 block-search task, same shape pairs
- Pair classified as “learned” or “non-learned” based on search task results
- Data from 200ms stimulus interval
- LiU patterns classified by k-Nearest Neighbors (KNN) algorithm

**Behavioral Results**

- Reaction time (RT) in Search Task determined “learned” or “non-learned” behavior
- Accuracy as ground truth for EEG pattern classification

**Pattern Classification Results**

- Learned vs. Non-Learned
  - 5-Fold cross-validation
    - Within-Participant: 69.10% grand mean
    - Between-Participant: 72.20% grand mean
    - $p = 0.35$
  - $p = 0.85$

**Conclusions**

- Discrimination between different periods of EEG activity—distinguishing between learned and non-learned stimuli—using a novel statistical learning model was achieved using a KNN classifier
- Using this information about how statistical learning occurs in the human brain, Brain-Computer Interface (BCI) algorithms could be developed to maximize a patient’s learning by recognizing and adapting to that patient’s learning rate.
Eva M. Perez-Cecenas, Business Administration, David Oros, Psychology, and Eugene Vaudry, Psychology  
Faculty Mentor: Dr. Rebekah A. Richert, Psychology  
Fantasy Perception as a Measure of Successful Transfer in Children’s Media

Literature has argued children are more likely to apply information from media to other contexts as they age and learn to identify which information is applicable to specific social situations (Richert, Robb, & Smith, 2011). Research has found 3- to 5-year-old children are more likely to claim media characters are pretend than older children (Woolley & Cox, 2007). Therefore, we hypothesize a possible link in the way a child perceives a character and the information learned from the character. Fifty-three children, ages 3 to 7 years old, watched video clips of cartoon characters solving problems and were then asked to solve an analogous real-life version of the problem. Following, children were asked whether they thought the characters were real or pretend. Data analysis will examine the relationship between children’s views that the character is pretend or real and children’s learning from that character. We predict younger children, ages 3 to 4.5, will be more likely to believe a character is real than older children. We also predict that children who believe a character is real will be more likely to correctly solve the analogous problem. If our hypotheses are supported, it can be argued that educational programming that is perceived as real by the child may support an increased likelihood of transferring lessons to a new context for young children.

Fantasy Perception as a Measure of Successful Transfer in Children’s Media  
Eva M. Perez Cecenas, David Oros, Eugene P. Vaudry, Molly A. Schlesinger, & Rebekah A. Richert

Introduction
- Children are more likely to apply information from media if they are perceived as applicable to real-life situations.
- Fantasy perception is a critical component of children's understanding of media characters.

Hypotheses
- Younger children are more likely to perceive media characters as real than older children.
- Children's perceptions of media characters influence their ability to apply information from the media to real-life situations.

Participants
- 53 children (30 boys, 23 girls)
- Ages 3 to 7 years old
- Pre-kindergarten to first grade

Procedures
- Children watched video clips of cartoon characters solving problems and were then asked to solve an analogous real-life version of the problem.
- Children were asked whether they thought the characters were real or pretend.

Measures
- Transfer of information
- Fantasy perception

Results
- Children who perceived the characters as real were more likely to correctly solve the analogous problem.
- Differences were significant between younger (ages 3 to 4.5) and older children.

Discussion
- Younger children may have difficulty distinguishing between what they see on TV and what is real life.
- Educational programming aimed at young children should be perceived as real to facilitate effective learning.

References

Contact
- Eva M. Perez-Cecenas
- David Oros
- Eugene P. Vaudry
- Molly A. Schlesinger
- Dr. Rebekah A. Richert

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Matthew Leitao, Psychology  
Faculty Mentor: Dr. Megan Robbins, Psychology

It's Not What You Say But How You Say It: Vocal Tone and Emotion Among Women Coping with Breast Cancer

Vocal tone may be important in coping with stressful situations such as breast cancer. Due to lack of research in this area, this was a feasibility study examined pitch (fundamental frequency), formants (additional frequencies), and general energy (amount of joules) from sound files recorded from the daily lives of three women with breast cancer. These participants were selected from a larger study (Robbins et al., 2014) based on their scores from the PANAS, a questionnaire measuring emotion, to represent an emotionally positive, negative, and neutral participant, relative to the larger sample. The sound files were recorded using the Electronically Activated Recorder (EAR) over a weekend. The files were processed through PRAAT to extract pitch, formants, and general energy. Files were also coded by research assistants for positive, negative, neutral, and mixed emotion to serve as a comparison to the vocal tone data. The results indicated that pitch and formants differed significantly for each participant. The positive participant had the highest pitch (followed by the negative, and then neutral participant) and almost double the standard deviation, indicating greater pitch variation compared to the others. Coded affect did not differ by vocal tone, except those coded as mixed affect had a larger mean and greater variation in general energy. This feasibility study revealed that there is a detectable difference between people who experience positive, negative, and neutral emotion and their vocal tones. Future research is necessary to investigate the connections between vocal tone and coping with a larger sample of participants.
Priyanka Singh, Chemical Engineering  
**Faculty Mentor:** Dr. Kawai Tam, Chemical and Environmental Engineering  
Alyssa Yan, Chemical Engineering  
Anna Almario, Chemical Engineering  
Effect of NOx-Out Device on Fuel Consumption and Differential Pressure of Small Off-Road Engines

Gasoline-powered small off-road engines (SOREs) contribute up to 20 percent of harmful pollution in many U.S. metropolitan cities because these engines are not as stringently regulated as automobiles. Currently, there are no affordable emission control devices for SOREs available on the market. To address this health and environmental issue, NOx-Out was designed to reduce pollutants, such as nitrogen oxides (NOx), volatile organic compounds (VOCs), carbon monoxide (CO) and particulate matter (PM) from SOREs using Selective Catalytic Reduction (SCR) technology. NOx-Out is a muffler-like device consisting of 1) mesh filter that captures PM; 2) SCR system with urea injection and copper zeolite catalyst coated on a honeycomb cordierite structure that converts pollutants to harmless chemicals; and 3) fiberglass absorption muffler that reduces engine noise. Before NOx-Out can be commercialized, the effects of the device on engine performance, whether it caused significant backpressure or changed fuel consumption, were determined. NOx-Out was tested on Generac GP 3300 portable generator under varying power loads. At the highest load of 3 kW, NOx-Out contributed 6.25 kPa of backpressure, which is comparable to standard stock mufflers and is also well below the 40-kPa maximum allowable backpressure for engines less than 50 kW. In addition, the generator only used an average of 2.24 percent more gasoline and emitted an average of 6.24 percent more CO2 with functional NOx-Out attached. These findings demonstrate that implementing NOx-Out on SOREs will not harm the engine or significantly increase fuel usage. Therefore, NOx-Out is safe and economical for consumers to use.

Lamees Alkhamis (Husk-to-Home member), Environmental Engineering  
**Faculty Mentor:** Dr. Kawai Tam, Chemical and Mechanical Engineering  
**Rice Husk: A Sustainable Building Material in the Philippines**

Husk-to-Home, a senior design group, was tasked to produce a particleboard from rice husk and non-formaldehyde emitting adhesives. The team was able to produce two types of boards where one uses a tannin-based adhesive and the other uses casein-based adhesive. Both boards were produced using a hydraulic press at pressures up to 0.25MPa. The boards were tested for mechanical properties including the peak load, which is also known as flexural strength, following the American Society of Testing and Materials (ASTM) D1037-99 testing standard. The results show that a tannin-based board has a peak load of 20 lbf, and a casein-based board has a peak load of 17.64 lbf. The boards were also tested for water resistivity as particleboards need to be sufficiently water resistant to maintain their viability. Using the ASTM D1037-99 testing standard, square sample boards of 1” × 1” were soaked in water at room temperature for 2 and 24 hours to evaluate short- and long-term changes. The casein-based board showed an expansion of 22.5% for the 2-hour test and a 28.6% expansion for the 24-hour test. The tannin-based board, however, ended up disintegrating and no conclusive results were acquired for the soak test. Lastly, termite testing (bioassay) was performed on pure rice husks and basswood (control) to investigate how resistant rice husk is to termite damage. Results indicate that termites will not feed on rice husk. This demonstrates the potential for using rice husks for the making of termite-resistant particleboards viable.
Cody A. Gonzalez, Mechanical Engineering  
Faculty Mentor: Sandeep Kumar, Mechanical Engineering  

*In Situ* TEM Observation of the Electrochemical Lithiation of Polysilicon Thin Films

One of the primary issues that restricts the development of new materials for next generation lithium ion batteries (LIB) is performance degradation over the lifecycle of the battery. Our goal is to elicit clear understanding of the mechanisms responsible for the degradation of performance that will help in designing better materials for the electrodes and improving the performance. The transmission electron microscope (TEM) is one of the premier tools to understand material behavior. We are developing an *in-situ* TEM LIB setup that would allow us to understand the material degradation during lithiation (charge) and delithiation (discharge). The primary material of the current study is Silicon since it has the maximum specific capacity of any anode for LIB’s. Through the use of photolithography, deposition, and etching techniques these devices are created and then tested via *In Situ* TEM. *Ex situ* experiments are currently being performed wherein a constant voltage will be applied across the device setup to observe the deformation mechanics of nanoscale Silicon. Preliminary results have yielded discoloration of the Polysilicon given prolonged exposure to Lithium and Ionic Liquid Electrolyte. Pending confirmation of successful lithiation through TEM observation of the lithiated Polysilicon, additional experiments will be conducted to determine the electrical and thermal properties of the lithiated Polysilicon. These additional experiments will provide the desired information about the deformation mechanics of Polysilicon as measurements can be taken after every cycle to determine how the properties of the material change as the Silicon becomes pulverized through the multiple cycles.

Spencer Salazar, Neuroscience  
Faculty Mentor: Dr. B. Glenn Stanley, Cell Biology and Neuroscience  
Michelle Calderwood, Psychology Systems Neuro  

Morphine-Induced Feeding via Intracranial Injection into the Lateral Septum: Identification of the Neural Substrates

Our laboratory has found that stimulation of opioid receptors in the lateral septum (LS) via intracranial injection of morphine, a µ-opioid receptor agonist, elicits feeding in satiated Sprague Dawley rats. Previous works have found that the LS is indeed connected to regions of the brain associated with feeding, reward and motivation, including the lateral hypothalamus and nucleus accumbens. With this in mind, we were interested in the efferent projections, and possible afferent-efferent networks that may be responsible for the feeding behavior observed in response to µ-opioid receptor stimulation in the LS. We utilized anatomical tract-tracing techniques and immunohistochemical (c-Fos) approaches that label activated neurons. We hypothesized that c-Fos expression would be visible in brain regions sharing direct connections with the lateral septal area, specifically the lateral hypothalamus and the nucleus accumbens. In our preliminary results, we did not find significant differences in c-Fos activation between morphine and control animals in the lateral hypothalamus or nucleus accumbens.
Sarah Allec, Applied Mathematics
Faculty Mentor: James Kelliher, Mathematics
Solving the Phase Problem from Few and Noisy Data

Determining the structure of biomolecules is a fundamental goal of modern biology. To the extent that the phase problem can be solved, progress is generally made in molecular biology, as exemplified by the results of crystallography over the past century. However, due to the difficulty in preparing crystals for most proteins, the domain of applicability of crystallography is limited. Thus the requirement emerges for extending the methods of crystallography to non-crystalline objects. Progress in several fields over the past three decades has opened the door to realizing this goal through a variety of experimental and computational techniques that together form the field of lensless imaging. For example, advances in accelerator physics, such as the development of large-scale X-ray free electron lasers, has enabled the realization of diffract-and-destroy techniques that have yielded the successful structural determination of virions and nanocrystals. Additionally, algorithmic developments have enabled the routine phasing of diffraction patterns from amorphous objects. However, such methodologies remain limited by the beam flux which remains insufficient to determine the three dimensional structure of biomolecules. To address this limitation, we and others previously developed an algorithm, called Adaptive Phase Retrieval (APR) that requires less diffraction data to solve the phase problem for amorphous objects. This computational framework applies to typical amorphous objects and can be extended to include prior knowledge when it is available. Here I report new results for solving the phase problem with noisy and incomplete data by using APR.
Jessica Nguyen, Biological Sciences  
Faculty Mentor: Dr. Subir Ghosh, Statistics  
Evaluation of Hygiene Kits Usage and Satisfaction of Riverside Free Clinic Patients for Improving Their Overall Health and Quality of Life

Growing from the collaborative concerns of students and doctors disturbed by the number of Riverside, CA locals without basic healthcare, UCR’s non-profit Riverside Free Clinic (RFC) was established in 2005. Recognizing the importance and need for managing personal hygiene among patients, the Hygiene Kits Committee was created within RFC to obtain and distribute toiletries to the clinic’s visitors. Many of RFC’s patients greatly rely on these kits to maintain their personal hygiene; however, recently, it was brought to the clinic’s attention that the toiletries provided were not enough to sustain them until subsequent clinic dates. The current goal of the Hygiene Kits Committee then, is to provide these patients with a larger variety and quantity of hygiene supplies, all while working within the clinic’s financial constraints. As an aid, this study was carried out to explore patients’ satisfaction towards the distributed hygiene kits, as well as their level of usage of the contents included. Paper surveys conducted in English and Spanish were distributed at RFC to collect the pertinent information. Beginning in the summer of 2015, RFC will use the analyzed results of these findings to effectively maximize their resources and refine their hygiene kit services, thereby bringing them closer to improving the overall health and quality of life for their patients.
Bijan Sasaninia, Microbiology
Faculty Mentor: Eugene A. Nothnagel, Botany and Plant Science
Martha Orozco-Cardenas, Director of Plant Transformation Research Center
Rojin Ghabadi, Zachary Cryder, Saba Wube, Gabriel Juloya, Brooke Weston, Seung Seo, Jiha Lee, Adrian Pardo

Organ Localization of a Methylated Cell Wall Sugar in Transgenic Tobacco Expressing a Moss Methyltransferase Gene

Certain methylated cell wall sugars are present in relictual plants but are scarce or absent in angiosperms and are thus of interest in evolutionary biology. Methylated sugar residues are also relevant to biofuel production because they can yield more synthetic diesel fuel by thermochemical conversion than can corresponding unmethylated sugars. Previous research in the laboratory has shown that transgenic expression of a *Physcomitrella patens* methyltransferase gene, MT1, in *Nicotiana tabacum* cv Xanthi causes synthesis of 3-O-methyl-galactosyl (3-O-Me-Gal) residues, a methylated cell wall sugar not found in wild-type tobacco. Because the constitutive, high-level cauliflower mosaic virus 35S promoter was used to drive the transcription of MT1, the hypothesis is that 3-O-Me-Gal will be expressed in all organs of the transgenic tobacco. To test this hypothesis, alcohol insoluble residue (AIR), a crude cell wall-enriched fraction, was prepared from leaf, stem, root, and flower of three different transgenic MT1 tobacco plants. These AIR preparations underwent methanolysis, derivatization, and gas chromatography-mass spectroscopy for analysis of glycosyl composition, including 3-O-Me-Gal. The results were consistent across the three plants with the 3-O-Me-Gal content averaging 1.62, 1.24, 0.81, and 0.47 mol% for leaf, flower, root, and stem, respectively. Ongoing research aims to determine where 3-O-Me-Gal is localized within the leaf cell wall, i.e., whether in the pectin, hemicellulose, or cellulose subfraction. This research was supported by CNAS HSI-STEM Undergraduate Research Program and by USDA NIFA grant 2008-35318-04599.
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Session Moderators

Dr. Guillermo Aguilar, Mechanical Engineering
    Dr. Kurt Anderson, Biology
    Dr. Steven Axelrod, English
    Dr. Gregor Blaha, Biochemistry
    Dr. Curt Burgess, Psychology
Rena Burton, Academic Resource Center
    Dr. Richard Cardullo, Biology
    Dr. Christine Gailey, Anthropology
    Dr. Subir Ghosh, Statistics
    Nassef Girgis, Study Abroad
    Dr. W. Hill Harman, Chemistry
    Dr. Erith Jaffe-Berg, Theatre

Dr. Dimitrios Morikis, Bioengineering
    Dr. Tanya Nieri, Sociology
    Dr. Eugene Nothnagel, Botany & Plant Sciences
    Dr. Connie Nugent, Cell Biology & Neuroscience
    Dr. Vorris Nunley, English
    Dr. David Pion-Berlin, Political Science
    Dr. Rebekah Richert, Psychology
    Dr. Joel Sachs, Biology
    Dr. Peter Sadler, Geology
    Dr. Dana Simmons, History
    Dr. Katharine Sweeney, Psychology
    Dr. Emma Wilson, Biomedical Sciences

Panelists

Workshop Session 1:
    Moderator: Beth Claassen Thrush, Undergraduate Education
    Clint Collins, Graduate Student - Biology
    Dr. Denver Graninger, History
    LaSharon McLean Perez, Study Abroad
    Randy Truong, Undergraduate Student - Computer Science

Workshop Session 2:
    Moderator: Gladis Herrera-Berkowitz, Director of Student Success Programs
    Dr. Marissa Brookes, Political Science
    Dr. Deborah Wong, Music
Workshop 3:
Moderator: Gladis Herrera-Berkowitz,
Director of Student Success Programs
Dr. Leonard Mueller, Chemistry
Robin Russin, Theatre
Tiffany Tai, Peace Corps

Workshop Session 4:
Moderator: Gladis Herrera-Berkowitz,
Director of Student Success Programs
Dr. Maria Franco-Aguilar, Graduate Division

Workshop Session 5:
Moderator: Beth Claassen Thrush,
Undergraduate Education
Cynthia Contreras, Current Student Facilitator
Colette King, R’Course Student Intern
Alberto Tam Yong, Current Student Facilitator

Workshop Session 6:
Moderator: Gladis Herrera-Berkowitz, Director of Student Success Programs
Dr. W. Hill Harman, Chemistry
Dr. Catherine Larsen, Chemistry
Geoffrey Pronovost, Undergraduate Student – Biochemistry-15/16 Goldwater Scholar
Connor Richards, Undergraduate Student – Physics-15/16 Goldwater Scholar
Julianne Rolf, Undergraduate Student – Chemical and Environmental Engineering - 15/16 Goldwater Scholar

Undergraduate Education Symposium Staff
Gabby Bobadilla, Student Assistant
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