UC DAVIS

Pursuing Your Vision

22nd UNDERGRADUATE RESEARCH Scholarship and Creative Activities CONFERENCE

Friday, April 29, 2011
3:00-5:00 p.m.
Freeborn Hall

and

Saturday, April 30, 2011
9:00 a.m. -12:30 p.m.
Wellman Hall

Sponsored by:
Office of the Provost, and the
Office of the Vice Chancellor, Student Affairs

UCDAVIS
22nd UNDERGRADUATE RESEARCH
Scholarship and Creative Activities CONFERENCE

WELCOME

Welcome to the 22nd Annual UC Davis Undergraduate Research, Scholarship & Creative Activities Conference, co-sponsored by the Office of the Provost and the Office of the Vice Chancellor for Student Affairs. This year we are proud to showcase the research endeavors of 353 undergraduate students from all academic fields.

The conference is designed to acquaint undergraduates with the process and rigors of presenting research in a scholarly manner in an academic setting. This opportunity allows for stimulating interaction between students and an audience of faculty, administrators, peers and family. An added goal is to encourage undergraduates to pursue advanced degrees that will lead to opportunities in research and teaching.

At UC Davis, many students have been participating in research that is part of a larger grant where faculty sponsors have given them substantial levels of responsibility to carry out specific components, either individually or collaboratively. Other students have initiated their own projects and have been conducting their research independently under faculty guidance. While many students are reporting on completed projects, some are presenting the latest data on research still in progress.

Students present their work at the conference in either an oral or poster format. For the three oral sessions, students are divided by topic into groups; each student gives a 15-minute presentation that includes a question and answer period. The oral sessions are moderated by a faculty member with expertise in the field and who might also serve as a faculty sponsor for one or more students. In the poster format, students design a visual representation of their research. During the poster session, they present their work and discuss the content individually with circulating conference attendees.

Each student presenter is recognized for his/her contribution to University research by being awarded a certificate as an Undergraduate Research Scholar. We congratulate these students for their accomplishments and hope that this experience helps to launch productive and satisfying academic and professional careers.

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The Undergraduate Research, Scholarship & Creative Activities Conference gratefully acknowledges the faculty sponsors and other individuals whose mentoring has contributed to the research produced by our presenters. We would also like to thank the many programs that generously support and encourage undergraduate research. Among these are the following: Biology Undergraduate Scholars Program (BUSP); California Alliance for Minority Participation in Science, Engineering, and Mathematics (CAMP); Davis Honor's Challenge; Integrated Studies Honors Program; Internship and Career Center; McNair Scholars Program; Mentorships for Undergraduate Research in Agriculture, Letters and Science (MURALS); Mentorships for Undergraduate Research Participants in the Physical and Mathematical Sciences (MURPPS); President's Undergraduate Fellowship; Undergraduate Research Center; UC Davis Washington Center and UC Leadership Excellence Through Advanced Degrees (UC LEADS).

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AGENDA

Friday, April 29, 2011

Freeborn Hall

3:00-4:15 p.m. ..... Poster Session 1
Freeborn Hall

4:15-5:30 p.m. ..... Poster Session 2
Freeborn Hall

Saturday, April 30, 2011

Wellman Hall

8:00-9:00 a.m. ..... Registration and Continental Breakfast
Wellman Hall Lounge

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Wellman Hall Rooms

10:15-11:15 a.m. ..... Oral Session 4
Wellman Hall Rooms

11:30-12:30 p.m. ..... Oral Session 5
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274 Rogatkin, Anna ..... Session 3 ..... Oral ..... 9:00 am ..... 119 Wellman
275 Rus, Holly ..... Session 1 ..... Poster 142 ..... 3:00 pm ..... Freeborn
276 Salazar, Sergio ..... Session 4 ..... Oral ..... 10:15 am ..... 115 Wellman
277 Samadzadeh, Kiana ..... Session 2 ..... Poster 149 ..... 4:15 pm ..... Freeborn
278 Saneski, Emily ..... Session 1 ..... Poster 144 ..... 3:00 pm ..... Freeborn
279 Sarabia, Francisco ..... Session 2 ..... Poster 151 ..... 4:15 pm ..... Freeborn

PRESENTERS (CONTINUED)

280 Saucedo, Margarita ..... Session 4 ..... Oral ..... 10:45 am ..... 119 Wellman

281 Sawaya, Natalie ..... Session 4 ..... Oral ..... 11:00 am ..... 233 Wellman

282 Schaecher, Phillip ..... Session 4 ..... Oral ..... 10:45 am ..... 226 Wellman

283 Schneider, Sarah ..... Session 3 ..... Oral ..... 9:15 am ..... 230 Wellman

284 Schuetter, Louis ..... Session 2 ..... Poster 153 ..... 4:15 pm ..... Freeborn

285 Sek, Albert ..... Session 4 ..... Oral ..... 11:00 am ..... 216 Wellman

286 Severson, Ashley ..... Session 5 ..... Oral ..... 12:00 pm ..... 115 Wellman

287 Shah, Sachi ..... Session 2 ..... Poster 155 ..... 4:15 pm ..... Freeborn

288 Sheikhon, Karamjeet ..... Session 2 ..... Poster 157 ..... 4:15 pm ..... Freeborn

289 Sherman, Alexander ..... Session 2 ..... Poster 159 ..... 4:15 pm ..... Freeborn

290 Shi, Wenting ..... Session 3 ..... Oral ..... 9:15 am ..... 126 Wellman

291 Shrestha, Prabina ..... Session 1 ..... Poster 146 ..... 3:00 pm ..... Freeborn

292 Siddique, Imteaz ..... Session 4 ..... Oral ..... 11:00 am ..... 202 Wellman

293 Silva Garcia, Abel ..... Session 1 ..... Poster 148 ..... 3:00 pm ..... Freeborn

294 Silveria, Mark ..... Session 4 ..... Oral ..... 10:45 am .... 212 Wellman

295 Slemmons, Katrina ..... Session 3 ..... Oral ..... 9:00 am ..... 212 Wellman

296 Sloan, Alexander ..... Session 1 ..... Poster 150 ..... 3:00 pm ..... Freeborn

297 Smith, Austin ..... Session 1 ..... Poster 152 ..... 3:00 pm ..... Freeborn

298 Smith, Justin ..... Session 5 ..... Oral ..... 12:15 pm ..... 229 Wellman

299 Sousa, Daniel ..... Session 1 ..... Poster 154 ..... 3:00 pm ..... Freeborn

300 Spahn, Justin ..... Session 3 ..... Oral ..... 9:15 am ..... 107 Wellman

301 Spector, Jacob ..... Session 1 ..... Poster 156 ..... 3:00 pm ..... Freeborn

302 Stanley, Henry ..... Session 2 ..... Poster 161 ..... 4:15 pm ..... Freeborn

303 Sward, Meredith ..... Session 5 ..... Oral ..... 11:45 am ..... 026 Wellman

304 Takakura, Ryoe ..... Session 4 ..... Oral ..... 10:15 am ..... 126 Wellman

305 Tam, KaYan ..... Session 1 ..... Poster 158 ..... 3:00 pm ..... Freeborn

306 Tay, Kevin ..... Session 4 ..... Oral ..... 10:15 am ..... 234 Wellman

307 Telis, Natalie ..... Session 4 ..... Oral ..... 10:45 am .... 229 Wellman

308 Tesfamariam, Leelye ..... Session 3 ..... Oral ..... 9:30 am ..... 006 Wellman

309 Thompson, Cortney ..... Session 1 ..... Poster 160 ..... 3:00 pm ..... Freeborn

310 Tornow, Stephannie ..... Session 5 ..... Oral ..... 11:30 am ..... 026 Wellman

311 Tran, Huy ..... Session 1 ..... Poster 162 ..... 3:00 pm ..... Freeborn

312 Trejo, Nidia ..... Session 5 ..... Oral ..... 12:15 pm ..... 006 Wellman

313 Tremaine, Elizabeth ..... Session 5 ..... Oral ..... 11:30 am ..... 119 Wellman

314 Tseng, Harry ..... Session 3 ..... Oral ..... 9:45 am ..... 212 Wellman

315 Tuvshintogs, Enkhee ..... Session 2 ..... Poster 163 ..... 4:15 pm ..... Freeborn

316 Urrutia, Cristina ..... Session 3 ..... Oral ..... 9:00 am ..... 006 Wellman

317 Urtecho, J.B. ..... Session 1 ..... Poster 164 ..... 3:00 pm ..... Freeborn

318 Valencia, Joel ..... Session 1 ..... Poster 166 ..... 3:00 pm ..... Freeborn

319 Vang, Mai ..... Session 2 ..... Poster 165 ..... 4:15 pm ..... Freeborn

320 Varadan, Ambarish ..... Session 4 ..... Oral ..... 10:45 am ..... 233 Wellman

321 Vega-Ramirez, Hugo ..... Session 4 ..... Oral ..... 11:00 am ..... 126 Wellman

322 Velasco, Lizbeth ..... Session 4 ..... Oral ..... 10:30 am ..... 115 Wellman

323 Velazquez, Eric ..... Session 3 ..... Oral ..... 9:45 am ..... 226 Wellman

324 Vo, Tam ..... Session 2 ..... Poster 167 ..... 4:15 pm ..... Freeborn

325 Voudouris, Hayley ..... Session 3 ..... Oral ..... 9:15 am ..... 115 Wellman

326 Vu, Thanh ..... Session 2 ..... Poster 169 ..... 4:15 pm ..... Freeborn

327 Vue, Song ..... Session 2 ..... Poster 171 ..... 4:15 pm ..... Freeborn

328 Vurens, Gerard ..... Session 2 ..... Poster 173 ..... 4:15 pm ..... Freeborn

329 Wais, Whitney ..... Session 4 ..... Oral ..... 10:30 am ..... 106 Wellman

330 Wang, Allen ..... Session 4 ..... Oral ..... 10:15 am ..... 233 Wellman

331 Wang, Emily ..... Session 2 ..... Poster 175 ..... 4:15 pm ..... Freeborn

332 Wilcox, Nellie ..... Session 3 ..... Oral ..... 9:30 am ..... 229 Wellman

333 Woldeyesus, Temesgen ..... Session 3 ..... Oral ..... 9:30 am ..... 212 Wellman

334 Wong, Casey ..... Session 1 ..... Poster 168 ..... 3:00 pm ..... Freeborn

335 Wong, Irene ..... Session 2 ..... Poster 177 ..... 4:15 pm ..... Freeborn

336 Wong, Spencer ..... Session 5 ..... Oral ..... 11:30 am ..... 126 Wellman

337 Wu, Brian ..... Session 4 ..... Oral ..... 11:00 am ..... 115 Wellman

338 Wu, Victoria ..... Session 2 ..... Poster 179 ..... 4:15 pm ..... Freeborn

339 Xie, Xiao Sandy ..... Session 1 ..... Poster 170 ..... 3:00 pm ..... Freeborn

340 Yakoobinsky, Dana ..... Session 1 ..... Poster 172 ..... 3:00 pm ..... Freeborn

341 Yamaguchi, Toshia Ann ..... Session 3 ..... Oral ..... 9:30 am ..... 226 Wellman

342 Yang, Angela ..... Session 4 ..... Oral ..... 10:30 am ..... 119 Wellman

343 Yang, Hanry ..... Session 3 ..... Oral ..... 9:00 am ..... 233 Wellman

344 Yasuda, Catherine ..... Session 2 ..... Poster 181 ..... 4:15 pm ..... Freeborn

345 Yau, Bianca ..... Session 1 ..... Poster 174 ..... 3:00 pm ..... Freeborn

346 Yazdi, Anahita ..... Session 1 ..... Poster 176 ..... 3:00 pm ..... Freeborn

347 Yee, Michele ..... Session 5 ..... Oral ..... 12:15 pm .... 115 Wellman

348 Ying, Jiajia ..... Session 2 ..... Poster 183 ..... 4:15 pm ..... Freeborn

349 Young, Candice ..... Session 3 ..... Oral ..... 9:45 am .... 229 Wellman

350 Yu, Mengjing ..... Session 4 ..... Oral ..... 11:00 am ..... 234 Wellman

351 Yuan, Shi Min ..... Session 1 ..... Poster 178 ..... 3:00 pm ..... Freeborn

352 Zhang, Han ..... Session 1 ..... Poster 182 ..... 3:00 pm ..... Freeborn

353 Zhang, Xiaoming Ellen ..... Session 1 ..... Poster 180 ..... 3:00 pm ..... Freeborn

POSTER SESSION 1
3:00-4:15 p.m.

96 George H. Liepart - Neurobiology, Physiology & Behavior
Is Resistance to Anoxia-Induced Calcium Influx the Mechanism for the Neuroprotection Exhibited by Hibernating Hamster Hippocampi?

98 Pamela Lin - Microbiology
Chemotaxis to Chemical Attractants by Pseudomonas putida F1

100 Madeline Mackie - Anthropology
The Relationship of Diet and Health in an Ancient California Population

102 Brenda Marin - Neurobiology, Physiology & Behavior
Can Point Mutations in Kinetochore Proteins Create Haploid Plants in Arabidopsis thaliana?

104 Naomi L. Martisius - Anthropology
Ancient DNA and Ancient Migrations at a 4000-Year Old Archaeological Site in the California Delta

106 Setong W. Mavong - Genetics
Cell Adhesion and Sex Comb Development in the Fruit Fly Drosophila melanogaster

108 Emmanuel V. Mendoza - Cell Biology
Genome-wide Analysis of KRAB-ZNF Binding and their Role in Recruitment of KAP1

110 Claudia A. Miranda - Psychology
Vocalizations During Play: An Early Indicator of Autism?

112 Vaishali Mittal - Biomedical Engineering
Determining the Functions of Mus81-Mms4 Phosphorylation Sites in Saccharomyces cerevisiae

114 Clare Mjolsness - Sociology
Innovation in Plant Biology: A Sociology of Scientific Knowledge Perspective on the Effects of Interdisciplinary and International Collaborations

116 Azad Mojadedi - Biomedical Engineering
Utilization of Cell-Deposited ECMs as Biomaterial Surface Coatings

118 Roxanna E. Moradi - Economics
CANCELLED
The U.S. Supreme Court Ensures That Free Trade Cannot Compete With the Status Quo

120 Nancy-Jaime M. Napan - Neurobiology, Physiology & Behavior
Diet of Fruit Flies Determines the Bacteria in Their Intestines

122 Tirumular C. Narayanan - Medieval & Early Modern Studies
Merovingians and Carolingians: Were They that Different? The Misconception of the Early Frankish Kingdom

124 Tran L. Nguyen - Biochemistry & Molecular Biology
Profiling of Lipids in Response to Hypertension Treatment - Aspirin and Plavix

126 Crystal Orozco - Nutrition Science
Vitamins A, C, and E and Autism Spectrum Disorder

128 Francisco A. Ortega - Chemistry
Optimization of a Low Cost Direct Route to the Thermoelectric Material, $Yb_{14}MnSb_{11}$

130 Kristen M. Perano - Biological Systems Engineering
Effect of Fiber on Greenhouse Gas Emissions from Stored Manure

132 Don P. Pham - Neurobiology, Physiology & Behavior
Deletion of p66 Does not Result in Alterations in Skeletal Muscle Mitochondrial Function

134 Gregory Pinto - Mathematics
Software for Exact Integration of Polynomials Over Polyhedra

136 Katherine W. Powelson - Wildlife, Fish & Conservation Biology
The Abundance of the Endangered Salt Marsh Harvest Mouse in the Diet of Barn Owls in the San Pablo Bay Wetlands

138 Shravan Rao - Neurobiology, Physiology & Behavior
The Effects of Chemical Compounds on 26S Proteasome Activity

140 Andrew J. Reimer - Biomedical Engineering
Assessing the Nature and Composition of TMJ Fibrocartilage in Relation to its Mechanical Properties

142 Holly M. Rus - Psychology
Personality Trait Generation Based on Knowledge of Past Behavior

144 Emily A. Saneski - Psychology
Maternal Verbal and Affective Style on Language Development in Children with Fragile X or Typical Development

POSTER SESSION 2
4:15-5:30 p.m.

1 Samson I. Aghedo - Neurobiology, Physiology & Behavior
Copper and Neurobehavior: Effects of Dietary or Genetic Cu Deficiency

3 Chance R. Anderson - Microbiology
Regulation of Early Cell Development in Myxococcus Xanthus

5 Jamie Arenson - Psychology
The Effects of Exclusion on Desire for Social Dominance

7 Tamara Banda - Biotechnology
Engineering Plant Resistance Against a Parasitic Weed with RNA Interference

9 Brian Barbier - Anthropology
Olivella Shell Bead Production Experiments

11 Travis Bartholomy - Chemical Engineering
Utilizing Interactions and Charge Transport Within Polymer/Fullerene Mixtures to Drive the Photovoltaic Effect in Organic Solar Cells

13 Rachel M. Borthwell - Biological Sciences
Establishing Cultures of Pig Tracheal Gland Cells to Analyze the Porcine Model of Cystic Fibrosis

15 Robert E. Brown - Exercise Biology
Understanding Cardiomyopathies Through a Molecular Modeling Approach

17 Joanna P. Brown - Psychology
The Multicultural Experience and Marginalization of Biracial Individuals

19 Michelle Cabrera-Ruiz - Biological Sciences
Adaptation and Fitness Level Differences in the Legume-rhizobium Mutualism in California Serpentine and Non-serpentine Grasslands

21 Juliana Campo Garcia - Biological Sciences
Quantifying Fmr1 mRNA Levels Throughout Development in Different Brain Regions in the Female KI Mouse Model for FXTAS

23 Alondra Cardenas - Neurobiology, Physiology & Behavior
An Atherosclerotic Phantom for the Validation of a Fluorescence Lifetime Imaging Technique

25 Natalie Caulk - Biological Sciences
Settlement Patterns of Two Flatfish Species in Relation to Coastal Oceanography

27 Jeff Chen - Environmental Toxicology
Effects of KRAS Activation and P53 Deletion on Pancreatic Cellular Plasticity

29 Rex C. Cheung - Mathematics
Counterexamples to the Hirsch Conjecture

31 Holly C. Christensen - Genetics
A Novel Method to Capture Stable Genomic R-loops In vitro

33 Brook M. Constantz - Biological Sciences
Comparing the 3D Morphology of Cambrian Thrombolites

35 Ravi Dandekar - Neurobiology, Physiology & Behavior
Expression of Components of the GABAergic Pathway in Fragile X Syndrome

37 Kristin Dang - Biological Sciences
Heart Disease in Women: Strategies for Risk Reduction

39 Rose Ann M. De Guzman - Nutrition Science
Sex Differences in Lung Toxicity from 1-Nitronaphthalene: Role of Microsomal Epoxide Hydrolase (mEH)

41 Rebecca Devereux - Biochemistry & Molecular Biology
Effects of Seed Density on Ecosystem Processes in California Annual Grasslands

43 Rebecca L. Distefano - Psychology
The Role of Experience in the Intersensory Perception of Pet Categories During Infancy

45 Jeffrey H. Elliott - Biological Sciences
The Effect of CaMKII on Sodium Entry in Cardiac Myocytes

47 Lindsay R. Epperly - Chemical Engineering
Support for Room Temperature Storage of Reconstituted High-density Lipoprotein: A Fourier Transform Infrared Analysis of Trehalose-based Stabilization

49 Kristin Ethier - Microbiology
APOBEC3H Haplotype I Localizes in the Nucleus Independently of an Active Transport Sequence

105 Krista Lee - Environmental Toxicology
Effects of Oxidative Stress on Gut-Associated Lactobacillus plantarum

107 Carly J. Lewis - Neurobiology, Physiology & Behavior
Hibernating Hamsters Exhibit Enhanced Neuroprotection at Low Temperatures

109 Shawn X. Li - Chemical Engineering
Improvement of Thermoelectric Performance of Mg2Si/Si Nano-Composites

111 Abbie S. Lieberman - Sociology - Organizational Studies
Couples, Young Children, and the Division of Labor

113 Xingchen Liu - Textiles & Clothing
Hybrid Soy Protein Isolate Fibers by Electrospinning

115 Maria Ly - Biomedical Engineering
Fabrication of Biocompatible and Ingestible Gelatin Nanofibers

117 Irene Ly - Biological Sciences
The Effect of Biophysical Cues on the Behavior of Canine Mesenchymal Stem Cells

119 Allison M. Manderfield - Genetics
Maximizing Trinucleotide Repeat Retention in E. coli

121 Anisha Mazloom - Chemistry
Development of Small Molecule Inhibitors of the Androgen Receptor DNA Binding Domain as Targeted Anti-Cancer Drugs for Prostate Cancer

123 Amela Mehmedovic - Biochemistry & Molecular Biology
Effects of Different Gelling Agents on the Number and Diversity of Microbial Isolates Recovered from Soil

125 Sandra Mineyev - Psychology
Binding Processes in Episodic Memory

127 Jay Modi - Exercise Biology
De-epithelialized Bladder Wall Transplantation: Epithelial In-Growth and Regeneration

129 Alexa Mutti - Evolution, Ecology and Biodiversity
The Role of the Planar Cell Polarity Pathway in the Development of a Sexually Dimorphic Trait in the Fruit Fly Drosophila melanogaster

131 Andrea M. Nelson - Linguistics
Japanese Case Markers and Language Learning: A Comparison of Public High School and Heritage Language School Learners

133 Donee M. Nguon-Pheng - Biological Sciences
Characterization of Root Uptake and Systemic Transport of Salmonella enterica SV Typhimurium into Melon Vines and Fruit

135 Ashley Ott - Cell Biology
The Energetic Impact of Calorie Restriction in p66Shc(-/-) mice

137 Paul J. Park - Food Science
AZC Tolerance of Saccharomyces cerevisiae Strains

139 Devan D. Patel - Neurobiology, Physiology & Behavior
Otubain1 Stabilizes Nrdp1 and ErbB3 Independent of it Catalytic Activity: Implications for ErbB3 Positive Breast Cancer

141 Eric Payne - Biological Sciences
Induction of a Novel B Cell Differentiation Pathway via Direct CD86-Mediated Stimulation of Memory B Cells

143 Christopher R. Peske - Anthropology
A Murder Mystery Solved: How Strontium Isotope Analysis can be used to Solve Questions on Mobility in Central California

145 Catrina G. Porter - English
God is Love, God is Food: The Devotional Eating Habits of Female Mystics of the Low Countries

147 Laura N. Putnam - Biotechnology
Genetic Screen to Identify Mechanisms Through Which Arabidopsis Mutants Compensate for Lack of Xyloglucan in Plant Cell Wall

149 Kiana Samadzadeh - Biological Systems Engineering
High Resolution Optical Imaging of Changes in Metabolic Activity of Human Breast Cancer Cells in Response to Molecular Targeted Therapy

151 Francisco J. Sarabia - Chemistry
Toward Activation and Reduction of CO_2 Using Redox Active Complexes

153 Louis J. Schuetter - Environmental Toxicology
Investigating Pain in Children Undergoing Iliac Crest Bone Grafting Surgery with Alveolar Clefts

155 Sachi Shah - Cell Biology
IAPP Oligomer: A Biomarker of Diabetic Cardio-Renal Dysfunction

157 Karamjeet K. Sheikhon - Chemistry
Enantioselective Synthesis of Substituted-3-Hydroxy-2-Oxindoles and Spirocyclic Oxindoles

159 Alexander J. Sherman - Neurobiology, Physiology & Behavior
Annexin 2 Regulation of S100-A10

161 Henry P. Stanley - Psychology
The Developmental Time-course of Sluggish Cognitive Tempo in ADHD

163 Enkhee Tuvshintogs - Biochemistry & Molecular Biology
Changing Chromosome Conformation by Spindle Pulling Forces

165 Mai C. Vang - Biological Sciences
Research with Low Literacy Asians: Testing the Feasibility of an Audio-Assisted Touch-Screen Computer Program

167 Tam N. Vo - Cell Biology
Quantification of Bacterial Populations on Tomato Surfaces Based on 16S rRNA Real Time PCR (qRT-PCR) as Alternative to Culture Dependent Techniques

169 Thanh M. Vu - Biotechnology
In vivo Cytotoxities of Novel Amiloride Congeners in an Intracerebral Glioma Xenograft Model

171 Song Vue - Design
Fabricating Hmong American: Using Indigenous Textile Motifs to Embrace a Bicultural Identity

173 Gerard M. Vurens - Genetics
The Epidermal Growth Factor Receptor and Drosophila melanogaster Tarsal Bristle Patterns

175 Emily L. Wang - Psychology
The Multicultural Experience and Cultural Grounding of Biracial Individuals

177 Irene Wong - Neurobiology, Physiology & Behavior
Geographic Variation in the Cost of Thermal Tolerance in Marine Copepod

179 Victoria Wu - Microbiology
Identification of Methyl Accepting Chemotaxis Protein in Chemotactic Response to Organic Acids in Pseudomonas putida

181 Catherine Yasuda - Wildlife, Fish & Conservation Biology
Phenotypic Plasticity of Head Morphology in an Introduced Population of the Banded Watersnake (Nerodia fasciata) from an Isolated California Waterway

183 Jiajia Ying - Biochemistry & Molecular Biology
Crystallization of Abf2 Protein-DNA Complexes

ORAL SESSION 3
9:00-10:00 a.m.

006 Wellman • Moderator: Lynn E. Roller

9:00 Cristina I. Urrutia – Art History
Imperial Power in the Cave at Sperlonga

9:15 Ashleigh L. E. Crocker – Art History
Roman Historical Narrative: The Etruscan Background

9:30 Leelye Tesfamariam – Design
The Hôtel de Soubise: Interior Design and Ornament in 18th Century Paris

9:45 Ellen A. Griesemer – Design
Evaluating the Environmental Impact of Four Fibers for Use in Textile and Fashion Design

026 Wellman • Moderator: Kari Lokke

9:00 Paul De Morais – English
The Victorian Governess: Subversive Representation, Ideology, and the Poetics of Hybridity in Emma, Jane Eyre, Vanity Fair, and Lady Audley's Secret

9:15 Lindsay E. Ream – English
Exploring the Modernist Theme of Alienation Within the Postmodernist Literature of Haruki Murakami

9:30 Stephanie S. Chow – English
Coping with Difference: Social Identity and Mediating Intergroup Conflict in Octavia E. Butler's Science Fiction Novels

9:45 Glenn R. Hoban – Comparative Literature
Reversals and Reconciliations: The Twilight Phenomenon as Wish Fulfillment

106 Wellman • Moderator: Suad Joseph

9:00 Arisa Hayashi – German
Representation of War Trauma in Family and Marriage

9:15 Sana F. Khan – International Relations
Stages of Integration and Development of the Muslim Community in United States: Post World War II to Present Day

9:30 Jessica Bray – Middle East/South Asia Studies
Intersections of Queer Identity: Middle Eastern and South Asian Americans

9:45 Jasmine S. Dorrell – Women's Studies
The Things You Learn at Home: Support Persons' Work with Survivors of Sexual Abuse

107 Wellman • Moderator: Scott Dawson

9:00 Serena E. Carbajal – Mechanical Engineering
Crack Growth at Loaded Holes With and Without Residual Stresses Under Spectrum Loading

9:15 Justin A. Spahn – Aerospace Science & Engineering
Design and Analysis of a Small Hybrid Engine Aircraft

9:30 Mateusz J. Malinowski – Aerospace Science & Engineering
Design and Analysis of a Small Hybrid Engine Aircraft

9:45 Michael Cunningham – Civil Engineering
Utilizati[illegible] in Rural Nicaragua CANCELLED

115 Wellman • Moderator: David Copp

9:00 Michelle C. Lee – Communication
Understanding Media Choices: The Effects of Boredom on Media Preferences

9:15 Hayley A. Voudouris – Political Science
Gender Bias in American Politics: The Media's Modern Witch-Hunt

9:30 Brian K. Moen – Philosophy
A Philosophical Evaluation of The Citizens United v. Federal Elections Commission Case

9:45 David E. Johnson – Managerial Economics
The Cause of the Inelastic Response of Child-Only Cases to the 1996 Welfare Reform

119 Wellman • Moderator: Richard Coss

9:00 Anna D. Rogatkin – Animal Biology
California Ground Squirrel (Spermophilus beecheyi) Tail Flagging in Response to Human and Dog Stimuli or Looking at Anti-predator Tail Flagging

9:15 Melody Chen – Animal Science
Antisnake Behavior of Wild California Ground Squirrels is Not Affected by Female Reproductive Status

9:30 Julia F. Palmer – Neurobiology, Physiology & Behavior
Developing Parameters for the Measurement of Prepulse Inhibition in Prairie Voles

9:45 Rebecca E. Koch – Evolution, Ecology and Biodiversity
Within and Between Male Variation in the Mechanical Sounds of the Greater Sage-Grouse

126 Wellman • Moderator: Daniel Potter

9:00 Stephanie D. Nguyen – Biochemistry & Molecular Biology
Identification of Environmental Regulators of Volatile Production in Plants

9:15 Wenting Shi – Plant Biology
Phylogenetic Position of the Maddenia Group Within Prunus (Rosaceae), Evidence from Pollen Morphology

9:30 Hoang T. Ha – Cell Biology
Tic40 Interacts with Heat Shock Proteins to Mediate Protein Transport Across the Chloroplast Inner Membrane

9:45 Tyler J. McCubbin – Biochemistry & Molecular Biology
Soybean and Arabidopsis SPEECHLESS Paralogs Exhibit Functional Equivalence In planta

202 Wellman • Moderator: Oliver Fiehn

9:00 Massud Atta – Nutrition Science
Exploring the Relationship Between Fatty Acid Oxidation and UCP-3 in Transgenic Mice

9:15 Michael G. Astudillo – Cell Biology
LRIG Proteins are Regulators of Multiple Cell Signaling Pathways Commonly Deregulated in Breast Cancer

9:30 Karen L. Chu – Biochemistry & Molecular Biology
Gene Regulation in Human Epithelial Cells in Response to Bacterial Toxin

9:45 Kevin Y. Chang – Biochemistry & Molecular Biology
Inhibition of Farnesyltransferase with FTI-277 Exacerbates Eosinophilic Influx in Allergic Airway Inflammation

212 Wellman • Moderator: Kit S. Lam

9:00 Katrina K. Slemmons – Cell Biology
The Role of MECT1- MAML2 in Site-specific LOH and DNA Fragmentation

9:15 Quoc sinh Le – Biochemistry & Molecular Biology
Soy Peptide Lunasin as a Peptidomimetic of Human Tumor Suppressor ANP32A

9:30 Temesgen Woldeyesus – Neurobiology, Physiology & Behavior
Promoting Anti-Tumor Effects Using a CD40 Stapled Liposomes

9:45 Harry P. Tseng – Biochemistry & Molecular Biology
Identification of Novel Peptide Ligands Targeting Leukocyte $\alpha L\beta 2$ Integrin

216 Wellman • Moderator: Susan P. Harrison

9:00 Rachael L. Olliff – Environmental and Resource Sciences
Test of Edaphic Specialization in Navarretia jepsonii

9:15 Marion E. Fischer – Animal Biology
Effect of Enzymes Added to Chloroform-Methanol Method for Total Lipid Extraction of Ground Tomato Seeds

9:30 Kevin Ma – Microbiology
Construction of a Plasmid for the Visualization of Xylella fastidiosa in Grapevines

9:45 Nikolay M. Ostrovskiy – Biological Sciences
Identification and Characterization of Early Development Regulators in Myxococcus xanthus

226 Wellman • Moderator: Daniel A. Starr

9:00 Minh Ngo – Biochemistry & Molecular Biology
Investigating a New Nuclear Migration Pathway in Caenorhabditis elegans

9:15 Joe T. Nguyen – Psychology
A Yeast Two-Hybrid Screen to Identify UNC-84 Cytosolic and Nucleoplasmic Interacting Partners

9:30 Toshia Ann Yamaguchi – Biological Sciences
Statins Inhibit Proliferation and Stimulate Apoptosis in Endometrial Stromal Cells

9:45 Eric M. Velazquez – Biochemistry & Molecular Biology
Identification of an Unknown Virus in a Rabbit Population with Fatal Gastrointestinal Disease

229 Wellman • Moderator: Frank Mitloehner

9:00 Jacob M. Murphy – Animal Science
Effects of Biotechnology on Greenhouse Gases from Feedlot Cattle

9:15 Mathew D. Cohen – Animal Science
Effects of Oxygenated Drinking Water on Gaseous Emissions, Rumen Microorganisms and Milk Production in Dairy Cattle

9:30 Nellie E. Wilcox – Genetics
Melanin Production Pathway as Potential Osmoregulatory System in Daphnia pulex

9:45 Candice Young – Biological Sciences
A Comparative Analysis of Na+/K+ ATPase Activity in Daphnia spp. Under Alternate Osmolyte Exposure

230 Wellman • Moderator: Alan R. Buckpitt

9:00 Helen C. Lam – Exercise Biology
Effects of MuRF-1 on Adipogenesis in Mice Muscle Primary Cells

9:15 Sarah M. Schneider – Chemistry
Cytotoxicity of Silicon Nanoparticles in Hepatocytes

9:30 Anahid Ebrahimi – Biomedical Engineering
Effects of Water Conditions on Ultrasound Image Quality

9:45 Sonia D. Revello – Environmental Toxicology
Sex Differences in the Toxicokinetics of Naphthalene After Acute and Repeated Exposure to Explain Susceptibility of Female Mice to Naphthalene

233 Wellman • Moderator: Julie M. Schoenung

9:00 Hanry Yang – Materials Science and Engineering
A Microstructural Study of Cryomilled Al-B_4C Nanocomposites

9:15 Salaimon Aminyar – Mechanical Engineering
Analyzing the Thermal Stability of Aluminum 5083-B4C (Boron Carbide) Cryomilled Nanocomposites

9:30 Mohammad M. Karimzada – Biochemistry & Molecular Biology
One-pot Preparation of Strain-Sensitive Gold Nanoparticle/Poly(dimethylsiloxane) Thin Film Composites

9:45 Yow-Ren Chang – Biochemical Engineering
Automated Deposition of Polyelectrolyte Multilayer Films Using Airbrushes and Motorized Linear Stage

234 Wellman • Moderator: Jesus De Loera

9:00 Kevin M. Chapman – Mathematics
The Euclidean Volume of the Moduli Space

9:15 Brandon E. Dutra – Mathematics
Software for Exact Integration of Polynomials Over Polyhedra

9:30 Samantha Capozzo – Mathematics
A New Proof of the Ellipsoid Algorithm of Linear Optimization

9:45 Katherine Burggraf – Mathematics
Volumes of Permutation Polytopes

ORAL SESSION 4
10:15-11:15 a.m.

006 Wellman • Moderator: Bagher Modjtahedi

10:15 Rebecca M. Cho – Textiles & Clothing
Understanding Our Current US Financial Crisis: What Went Wrong and the Next Steps

10:30 Akshaya Ganesh – Managerial Economics
The Federal Reserve Board: Organizational and Research Intelligence Gathering During a Recessionary Episode

10:45 Arielle C. Guest – Community and Regional Development
Making Money: Challenges and Benefits of Community Currency Systems

11:00 Joseph W. Lawlor, Jr – Community and Regional Development
Mobile Banking Kenya: The Growth of an Industry

026 Wellman • Moderator: Keith D. Watenpaugh

10:15 Amanda Domingues – History
Invisible Women-Beer Brewers in Colonial Kenya

10:30 Victoria N. Martin – Religious Studies
The Role of Religious Institutions in the Rwandan Genocide

10:45 Rima Kalush – History
The Independent Libyan State and the Continuity of Political Development

11:00 Karina Piser – International Relations
Understanding Extremism: Casualties and Public Attitudes in the Al-Aqsa Intifada

106 Wellman • Moderator: Erin Hamilton

10:15 Bridgitte C. Rivers – Community and Regional Development
What Makes a Community Successful? Redefining Neighborhood Success to Include Use

10:30 Whitney E. Wais – Community and Regional Development
Underparked: Balancing Community Needs with State Goals

10:45 Kelly Arnold – International Relations
Go Big or Go Home: Why Mega-game Hosts' Housing Policies for the Urban Poor Vary Dramatically in a Globalized World

11:00 Onelica C. Andrade Afonso – International Relations
Natural Disasters and Migration

115 Wellman • Moderator: Miroslava Chavez-Garcia

10:15 Sergio A. Salazar – Exercise Biology
History Re-created Through a Comic Book

10:30 Lizbeth A. Velasco – Biological Sciences
The Chicano Movement: Using Media Production for the Betterment of the Community

10:45 William J. Ramirez – Spanish
Miguel Angel Asturias and the Blending of Identities and Cultures in a Globalized "Guatemala"

11:00 Brian Wu – Psychology
Fair Use in National and International Asia: Case Studies on Otaku Culture

119 Wellman • Moderator: John P. Capitanio

10:15 Dinah R. Davison – Animal Biology
Individual Differences in Grooming Patterns Among Rhesus Macaques (Macaca mulatta)

10:30 Angela Yang – Animal Science
Effects of Maternal Vocalization and Heart Beat Rhythm on Reduction of Abnormal Behaviors in Rhesus Monkeys: A Study with Artificial Mothers

10:45 Margarita T. Saucedo – Anthropology
Response to Solicitation of Agonistic Aid in Captive Rhesus Macaques (Macaca mulatta)

11:00 Kelsey Horvath – Animal Science
Responses to Environmental Stimuli by Orange-winged Amazon Parrots

126 Wellman • Moderator: Janine M. LaSalle

10:15 Ryoe W. Takakura – Biochemistry & Molecular Biology
Post-Translational Modifications: Flipping the Switch on MeCP2 Regulated Gene Expression

10:30 Samuel W. Chadwick – Neurobiology, Physiology & Behavior
Investigation of Chromosome 15q Duplication Syndrome Using Postmortem Human Brain

10:45 Justin O. Aflatooni – Biochemistry & Molecular Biology
Determining the Cellular Colocalization of Transcription Factors Implicated in Neurodevelopmental Disorders in the Embryonic Mouse Cortex

11:00 Hugo Vega-Ramirez – Neurobiology, Physiology & Behavior
The Role of Neuronal Activity in Dendritic Spine Formation

202 Wellman • Moderator: Shota Atsumi

10:15 Erin F. Lennon – Environmental Science & Management
Microalgal Biomass as a Species-Specific Indicator of Lipid Content

10:30 Oliver Glenn V. Hernaez – Biochemistry & Molecular Biology
Metabolic Engineering and Synthetic Biology Approaches to Produce Biofuels Directly from Carbon Dioxide

10:45 Edrianne P. Aguilar – Civil Engineering
The Determination of the Rate at Which Triclocarban and Triclosan Desorb from Biosolids

11:00 Imteaz Siddique – Biochemistry & Molecular Biology
Pyridostigmine Bromide Protection Against Acetyl Cholinesterase Inhibition by the Organophosphate Diisopropyl Fluorophosphate

212 Wellman • Moderator: Holland Cheng

10:15 Jinwen Hui – Genetics
Assessment of 3D Reconstruction Quality and Resolution Improvement Using Fourier Ring Correlation and Spectral Signal-to-Noise Ratio

10:30 Jeffrey Hu – Cell Biology
Evidence of gp120 Quaternary Shift Upon Ligand Binding in HIV Env Recombinant Immunogen

10:45 Mark Silveria – Biochemistry & Molecular Biology
Metabolic Quantification Using GC-CI-QQQ-MS

11:00 Laura Andronic – Biochemical Engineering
Detection of IAPP and $A\beta_{1\text{-}42}$ Oligomers in Serum by Water Proton Magnetic Resonance Spectroscopy

216 Wellman • Moderator: Lifeng Xu

10:15 Heather Leo – Biochemistry & Molecular Biology
Modifications of the TIN2 Gene in Human Cells Using Zinc Finger Nuclease

10:30 Ezen Choo – Environmental Toxicology
The Role of Reactive Oxygen Species in Modulation of p21 Activated Protein Kinase Activity

10:45 Anna Michelle Dillier – Biomedical Engineering
Determining the Limit of Detection of a Multiplex LATE-PCR Assay for Pathogen Detection in Critically Ill Patients Using Genomic DNA

11:00 Albert C. Sek – Microbiology
A Green Fluorescent Protein (GFP) Screen for Novel Disc Proteins in Giardia intestinalis

226 Wellman • Moderator: David Hawkins

10:15 Steven M. Meinert – Exercise Biology
An Empirical Model Characterizing the Material Properties of Tendons and Ligaments as a Function of Age and Loading History

10:30 Rosa Marie M. Ferris – Exercise Biology
Gastrocnemius and Soleus Muscle Contributions to Ankle Plantar Flexion Torque

10:45 Phillip Schaecher – Biomedical Engineering
Gelation Time of Fibrin Hydrogels is Dependent on Microsphere Composition

11:00 Soyun (Michelle) Hwang – Biochemistry & Molecular Biology
Effects of Meclofenamate Sodium, a Nonsteroidal Anti-inflammatory Drug, on Proteasome Activity and Myotube Formation in Muscle Cells

229 Wellman • Moderator: John D. Furlow

10:15 Gretchen P. Marcelino – Cell Biology
Determining the Origin of Longtail Macaques Using SNPs on mtDNA and Microsatellites (STR)

10:30 Marissa L. Hughbanks – Biological Sciences
The Effect of Substratum Compliance on Endothelial Cell Behavior

10:45 Natalie Telis – Cell Biology
Quantification of Urinary HDL Loss in Immunoglobulin A Nephropathy

11:00 Elaine G. Garcia – Neurobiology, Physiology & Behavior
Development of Transgenic Xenopus laevis as an In vivo Screening System for Endocrine Disrupting Chemicals

230 Wellman • Moderator: Artyom Kopp

10:15 Gabe Green – Biotechnology
The Effects of Human Insulin on Mosquito Innate Immunity

10:30 Eric A. Flounders – Biological Sciences
Search for Alternative Repellents: A Behavioral Study

10:45 Pamela M. James – Genetics
Midgut pH as a Physiological Barrier to Bacterial Colonization in Drosophila melanogaster

11:00 Kanaga Sundari Arul Nambi Rajan – Genetics
An mRNA-Seq Approach to Identify Nanos1 Binding Targets

233 Wellman • Moderator: Johan Leveau

10:15 Allen Wang – Genetics
Yeast-two Hybrid Screening to Identify UNC-84 Binding Partners

10:30 Jonathan A. Kuhn – Biochemistry & Molecular Biology
Investigating a Pathway for Nuclear Migration in C. Elegans

10:45 Ambarish C. Varadan – Microbiology
Using Reverse-Taxonomy in Order to Obtain a Significant Estimate of Soil Nematode

11:00 Natalie A. Sawaya – Biochemistry & Molecular Biology
Project Collifornia: The Microbial Ecology of Collimonads at the Jug Handle Reserve

234 Wellman • Moderator: Bruce Gates

10:15 Kevin M. Tay – Chemical Engineering
Conversion of Cyclohexanone Catalyzed by Platinum Supported on Alumina: Reaction Network

10:30 Jonathan N. Doan – Chemical Engineering
Catalytic Conversion of Furan

10:45 Ryan R. Limbo – Chemical Engineering/Materials Science & Engineering
Catalytic Conversion of 4-Methylanisole

11:00 Mengjing Yu – Chemical Engineering
Validating Green Screen with 37 Selected Chemicals from the U.S. Chemicals Manufacturing Industry

ORAL SESSION 5
11:30-12:30 p.m.

006 Wellman • Moderator: Susan Avila

11:30 Zoe M. Fujii – Design
The Allure of Sagrada Familia

11:45 Mary J. Guillen – Design
Revolutionary Synthesis: An Exploration of Society Under Oppression

12:00 Jennifer Ma – Design
Fashionable Skin

12:15 Nidia Trejo – Design
Revival of Forgotten Techniques: The Elizabethan Ruff

026 Wellman • Moderator: Julie Sze

11:30 Stephannie A. Tornow – American Studies
Selling a Sexier World: Negotiations of Class, Sexuality, and Citizenship

11:45 Meredith Sward – Technocultural Studies
Perfect Plastic

12:00 Melissa Muganzo – Community and Regional Development
Dance is Communication: I Speak with My Body

106 Wellman • Moderator: Cecilia Colombi

11:30 Manuel Ceja Lopez – Spanish
Is Spanish a Threat or a Blessing?

11:45 Kristy D. Ayala – Spanish
Being Bilingual in California, a Must!

12:00 Jennifer K. Ho – Linguistics
Cultural Heritage Language in Third Generation Chinese-Americans

12:15 Iris Lin – Sociology
International Students Lacking Cultural Competence: Desire, Motivation, and Ability in Forming Friendships with Native Students

115 Wellman • Moderator: Stephanie Mudge

11:30 Christina Robinson – Anthropology
Connect the Unexpected: Explaining the Exception to the Rule in Educational Attainment

11:45 Amanda J. Khoe – Human Development
Lessons in Organizational Adaptation from the American Federation of Teachers: A Historical Analysis

12:00 Ashley Severson – Sociology
College and Social Class: Extending Lareau to High School Students

12:15 Michele Yee – Sociology
School-Level Factors in Rates of Student Completion of California Public Four-Year University Minimum Admission Requirements

119 Wellman • Moderator: Katharine Graf Estes

11:30 Elizabeth J. Tremaine – Psychology
Does a Melody Facilitate the Learning of a Grammatical Pattern in 15-month-old Infants?

11:45 Lauren Rice – Psychology
The Effects of Repeated Questioning on a Child's Ability to Give an Accurate and Consistent Testimony in a Legal Setting

12:00 Natalie M. Lucia – Human Development
Emotion Regulation in Middle Childhood

12:15 Rocio Garcia – Psychology
Contingencies of Self-worth as a Determinant of Job Resilience

126 Wellman • Moderator: Dag Yasui

11:30 Spencer Wong – Genetics
Examining R-Loop Formation by a Non-Coding RNA Arising from the Prader-Willi Critical Region on Chromosome 15

11:45 Florence K. Crary – Biochemistry & Molecular Biology
Measuring Chromatin Structure of Chromosome 15 by DNA FISH in Aicardi-Goutieres Syndrome Cells

12:00 Linley M. Mangini – Environmental Toxicology
Sympathetic Innervation of Target Tissues is Altered in Rats with Subchronic Exposures to the Organophosphorus Pesticide Chlorpyrifos

12:15 Hamza Ahsan – Chemical Engineering
A Search for Biochemical and Post-translational Protein Modifications Induced by Chromosome Bridges in Saccharomyces cerevisiae

202 Wellman • Moderator: John I. Yoder

11:30 Jennifer M. Hayashi – Microbiology
An Investigation into Gene Expression Patterns of Obligate Symbiotic Frankia Bacteria in Datisca glomerata Root Nodules

11:45 Christopher J. Knight – Evolution, Ecology and Biodiversity
Plant Communication: Volatile Organic Compounds Role in Eliciting Plant Defense Mechanisms and How Genetic Relatedness Affects the Elicitation

12:00 Mar Joseph B. Odias – Biological Sciences
Delivery of PGIP from Rootstocks for Pathogen Protection in Grafted Tomatoes

12:15 Calvin Diep – Exercise Biology
Gene Coding for Parasitic Weed Resistance

212 Wellman • Moderator: Tony J. Simon

11:30 Ehsan Ejaz – Neurobiology, Physiology & Behavior
Cajal Retzius Neuron Density in Autism

11:45 Arjun Banerjee – Biological Sciences
Correlation of Conjunctival Microangiopathy with Retinopathy in Hypertension Patients

12:00 Monika Farhangi Oskuei – Neurobiology, Physiology & Behavior
Difference in Spatial Cognition in Children with Chromosome 22q11.2 Deletion Syndrome Compared to Typical Developing Group

12:15 Alyssa A. Hamlin – Genetics
Sleep Apnea in Fragile X Premutation Carriers With and Without Fragile X-associated Tremor/Ataxia Syndrome (FXTAS)

216 Wellman • Moderator: Xi Chen

11:30 Larissa K. Miyachi – Biochemistry & Molecular Biology
Functionalized Nanoparticles for Site-Specific Chemotherapy: DNA Linkers and Radiation-Induced Ligand Release

11:45 Liana Hie – Chemistry
Chemoenzymatic Synthesis of Heparan Sulfate Oligosaccharides and Derivatives

12:00 Arjun M. Nair – Biomedical Engineering
A Monte Carlo Computational Study of Cancer Cell Death

12:15 Darach Miller – Genetics
Screening and Investigating Interactions Between Haloarchaeal Species

226 Wellman • Moderator: Frank J. Loge

11:30 Samantha M. Lubow – Community and Regional Development
Using Portable Landfill Devices to Convert Waste into a Community Building Resource and as a Waste Awareness Campaign

11:45 Brennan B. Bird – Natural Sciences
Construction of a Cob Bench in the UC Davis Sustainable Living Learning Community to Study Davis Clay Soils as an Earthen Building Material

12:00 William Quinn – Environmental Policy Analysis & Planning
Saving Some Green: An Analysis of Federally Endorsed Woody Biomass Utilization Programs in the United States

229 Wellman • Moderator: William D. Ristenpart

11:30 John C. Creasey – Chemical Engineering
Electrically Modulated Partial Coalescence of Oppositely Charged Droplets

11:45 Graham R. Magill – Chemical Engineering
Numerical Simulations of Electrostatically Induced Aggregation and Coalescence in Polydisperse Emulsions

12:00 Megan A. Clendenin – Physics
Do Gravitational Lenses Lie on Biased Lines of Sight?

12:15 Justin C. Smith – Physics
Dirac Point Degenerate with Massive Electronic Energy Bands at a Topological Quantum Critical Point

230 Wellman • Moderator: Chao-Yin Chen

11:30 Julia V. Gorgone – Neurobiology, Physiology & Behavior
Maintained Baroreflex Sensitivity During Entry into Hibernation in the Syrian Hamster

11:45 Lance R. Peery – Neurobiology, Physiology & Behavior
The Baroreflex - Is It Out of Control in Hibernation?

12:00 Anna D. Manis – Biochemistry & Molecular Biology
Can Histamine Act on Multiple Hippocampal Regions to Prolong Hibernation Bout Duration?

12:15 Andrew Campion – Neurobiology, Physiology & Behavior
Comparison of the Oxidative Capacity of Skeletal Muscle in Migratory and Resident White-crowned Sparrow (Zonotrichia leucophrys)

233 Wellman • Moderator: Holland Cheng

11:30 Benjamin Hsieh – Microbiology
Structure of Recombinant HEV Reassembled Particles Encapsidating DNA with HIV Epitope

11:45 Lesley Jones – Biological Sciences
Construction and Characterization of a Dual Hepatitis A + E Oral Vaccine Using Virus like Particles

12:00 Zi Mei Jiang – Biochemistry & Molecular Biology
Human SUN1 and nesprin-4 Functions at the Worm Nuclear Envelope

12:15 Lindsay Martsching – Genetics
Nuclear Expression of the MUC1 Extracellular Domain Protein

234 Wellman • Moderator: David A. Hawkins

11:30 Micaela McNulty – International Relations
The Medicines Patent Pool: How Essential is it for Increasing Access to Antiretroviral Medication in Developing Countries?

11:45 Gal Ozery – Biological Sciences
Waiting for a Bed: Emergency Department (ED) Patient Preferences for Boarding When the Hospital is Full

12:00 Rajiv Narayan – Critical Economics
The Lived Experience of Obesity

12:15 Kelsey H. Collins – Exercise Biology
Estimating Ground Reaction Forces During Locomotion in Adults 18-25 Years Old from Biotrainer and ActiGraph Activity Monitor Data

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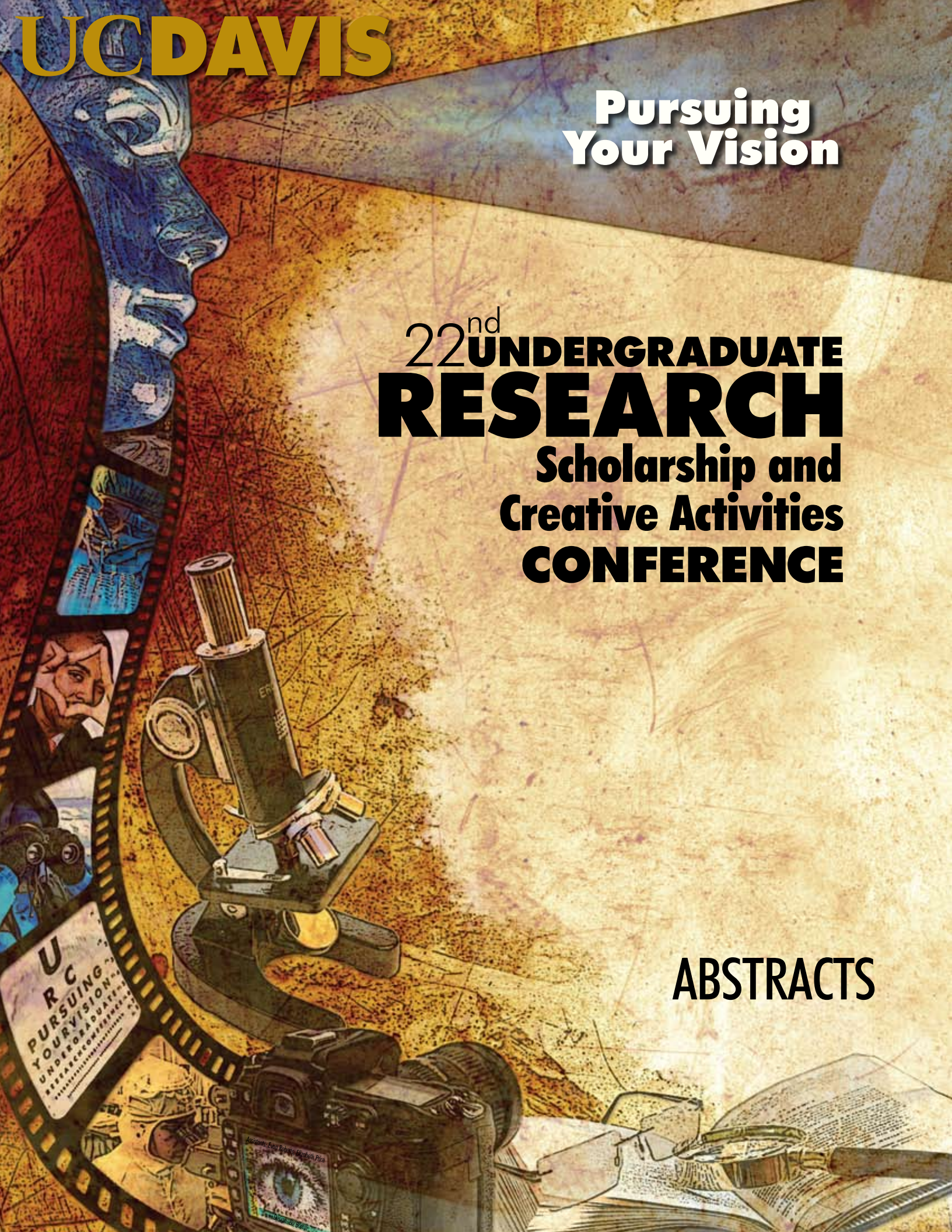

ABSTRACTS

ABSTRACTS

Determining the Cellular Colocalization of Transcription Factors Implicated in Neurodevelopmental Disorders in the Embryonic Mouse Cortex

Justin O. Aflatooni
Sponsor: Janine M. LaSalle, Ph.D.
Medical Microbiology & Immunology

Mutations in the X-linked gene *MECP2* causes the disease Rett syndrome, which is characterized by severe cognitive, social, and neurodevelopmental retardation around 6-18 months of age. Recently, mutations in the autosomal genes *FOXG1* and *MEF2C* have been implicated in causing a congenital variant of Rett Syndrome. In humans, MECP2, MEF2C, and FOXG1 are all transcriptional regulators that play critical roles in early neurogenesis during embryonic development. Given that these three factors all produce similar neurodevelopmental disorders, and are all expressed in the developing nervous system, it would be beneficial to assess whether they exhibit overlapping protein expression patterns. Using an immunofluorescence assay I have designed an experiment to determine if MEF2C and FOXG1 colocalize with MECP2 in the developing mouse cortex. This will provide valuable insight into the manner in which the protein products of these three genes contribute to abnormal brain development and the associated phenotype displayed in the disease Rett Syndrome.

Copper and Neurobehavior: Effects of Dietary or Genetic Cu Deficiency

Samson I. Aghedo
Sponsor: Janette Uriu-Adams, Ph.D.
Nutrition

In schizophrenic patients, there is reduced pre-pulse inhibition (PPI) response to auditory stimuli. PPI is a neurological sensory gating that allows individuals to filter out (inhibit) stronger auditory stimulation (pulse) after they have been exposed to weaker stimulation (prepulse). Mice null for the Ctr-1 Cu transporter die in utero. Ctr1 heterozygotes survive but have a 40% decrease in brain Cu concentration compared to wildtype. In this study, we examined the PPI response of a) C57Bl6 mice (same genetic background as Ctr-1 mice) and b) Ctr1 heterozygotes and WT after being fed a Cu adequate or Low Cu diet. Preliminary results show there was a trend for C57Bl6 mice fed the Low Cu diet to have reduced PPI compared to Cu adequate animals (P=0.07). For the transgenic mice, WT Ctr1 fed Cu adequate diet had a greater PPI compared to Low Cu WT Ctr1 mice. Cu adequate WT Ctr1 had greater PPI response compared to Cu adequate Ctr1 heterozygotes. For the Ctr-1 heterozygotes, there is no significant difference between diet groups. The study is ongoing and additional data will be collected. Results to date indicate that low brain Cu is associated with reduced PPI, which is also observed in schizophrenia.

The Determination of the Rate at Which Triclocarban and Triclosan Desorb from Biosolids

Edrianne P. Aguilar
Sponsor: Thomas M. Young, Ph.D.
Civil and Environmental Engineering

Triclocarban (TCC) and Triclosan (TCS) are antimicrobial agents found in personal care products and cleaning supplies. TCS is known to be poisonous to aquatic bacteria. TCC had been shown to act as endocrine disruptors. Previous studies have shown that the majority of TCC and TCS entering wastewater treatment plants end up in sludge. Sludge is usually treated to what is known as biosolids. Biosolids can be disposed of via land application, incineration, or landfill. The purpose of this research was to determine how fast TCC and TCS desorb from aerobic and anaerobic biosolids. Batch desorption experiments were conducted with biosolids. Tenax, a porous absorbent was added to the reactor. Samples were tumbled for a pre-determined amount of time. At the end of the contact time, tenax was removed and fresh tenax added. Tenax was extracted twice and the extracts were concentrated and analyzed on the liquid chromatography-mass spectrometer to determine the concentration of TCC and TCS that desorbed from the biosolids. It is expected that the rate of desorption for TCC and TCS faster for earobic than anaerobic biosolids because aerobic has a higher quantity of organic matter to which TCC and TCS are attracted.

A Search for Biochemical and Post-translational Protein Modifications Induced by Chromosome Bridges in *Saccharomyces cerevisiae*

Hamza Ahsan
Sponsor: Ken Kaplan, Ph.D.
Molecular and Cellular Biology

Proper chromosome segregation in mitosis is essential for genome maintenance in all living organisms. Although most chromosomes segregate to daughter cells during anaphase, small regions of connected chromosomes, termed "chromosome bridges", stretch across the cell delaying complete segregation. The inability to resolve these bridges has been linked to Human diseases such as Bloom's Syndrome and Fanconi Anemia Syndrome. Although the phenomenon of chromosome bridges has been characterized, it remains unclear how the cell cycle monitors bridges. We hypothesize that chromosome bridges "signal" to change the rate of anaphase spindle elongation, delaying exit from mitosis until bridge resolution has fully occurred. To test this, we are using Saccharomyces cerevisiae to identify post-translational modifications in spindle-associated proteins induced by chromosome bridges. As a first step, I have developed a protocol to enrich for anaphase cells with chromosome bridges. Future work will focus on biochemical analysis of protein modifications following enrichment. Once identified, modified proteins will be analyzed for their role in anaphase and to ascertain the significance of the modifications for anaphase progression and bridge resolution. Results from this work will have important implications for understanding how normal cells accurately segregate chromosomes and how failures might contribute to human disease.

Neuroticism and Knowledge of Cancer as Predictors of Effective Support for Cancer Patients

Annissyah A. Alamsyah
Sponsor: Cynthia Pickett, Ph.D.
Psychology

Past research reported that optimism is a positive trait that may determine the helpfulness of support provided for patients with chronic illness such as cancer. Current research examined the role of personality traits (i.e., optimism and neuroticism) of support providers in delivering effective and appropriate support for cancer patients. We hypothesized that knowledge and/or experience of the disease would help people with high level of optimism to provide appropriate support to others, while people with high level of neuroticism would not benefit from the knowledge or experience. In this study, participants completed an online questionnaire that included optimism and neuroticism personality tests, demographic questions, and several general questions about cancer and their experience with the disease. After multiple analyses, we found that neuroticism and inadequate knowledge of cancer were both significant predictors of ineffective support. Moreover, optimism did not predict effective support even when paired with high levels of knowledge of the disease.

Biochemical Characterization of the TULP Family

Spenser C. Alexander
Sponsor: Lorena Navarro, Ph.D.
Microbiology

The tubby-like protein (TULP) family consists of Tubby, the founding member, and three tubby-like proteins (Tulp1-Tulp3). In mammals, gene deletion of TULP family members results in disease phenotypes. Despite this importance, the biochemical functions of tubby-like proteins are still unknown. Structure-based functional analysis of the C-terminal domain of Tubby suggests that TULPs may function as a novel class of transcription factors downstream of a G protein-signaling pathway. Upon activation of the G protein Gαq, Tubby is removed from the plasma membrane and localizes to the nucleus. The C-terminal domain of Tubby targets Tubby to the plasma membrane whereas the N-terminal domain contains a nuclear localization sequence. We hypothesized that many, if not all, Tubby family members share this characteristic. The N- and C-terminal fragments of Tubby, Tulp1, Tulp2 and Tulp3 were PCR amplified using TULP-specific PCR primers. After restriction enzyme digestion, these fragments were cloned into the pEGFP vector generating GFP-tagged forms of TULP family members. Subsequent immunofluorescent studies will reveal the cellular localization of individual N- and C-terminal domains of TULPs. By providing a molecular understanding of TULP function, these studies will substantially increase our knowledge of how TULPs contribute to normal cell function.

Engineering *Escherichia coli* for Light Responsive Pattern Generation

Yasmin L. Amin
Sponsor: Marc T. Facciotti, Ph.D.
Biomedical Engineering

Escherichia coli is a bacterium that can be found in the human intestine. It normally is not exposed to light, and has no endogenous mechanisms for responding to light. However, the ability to engineer *E. coli* to respond to light has been proven possible [1]. Using this light responsive circuit with knowledge about bacterial communication, it is possible to control population-level bacterial gene expression in 2 and 3 dimensions with light. This ability could be used to generate complex patterns with the engineered *E. coli*. I will attempt to construct a synthetic circuit that would allow me to generate patterns in a group of inter-communicating cells in response to a light stimulus. First, I will reproduce a published experiment where *E. coli* are engineered to produce a visible pigment in response to light [1]. When plated, these *E. coli* produce a two-dimensional chemical image that corresponds to the pattern of the projected light. Second, I will combine the light responsive circuit to cell-cell communication by harnessing quorum sensing circuits available in the Registry of Biological Parts. Together, these circuits will generate a light-sensitive and spatially aware population of *E. coli*.

Analyzing the Thermal Stability of Aluminum 5083-B_4C (Boron Carbide) Cryomilled Nanocomposites

Salaimon Aminyar
Sponsor: Julie M. Schoenung, Ph.D.
Chemical Engineering and Materials Science

The addition of B_4C reinforcements in nanostructured aluminum alloys has been shown to increase both strength and stiffness compared to unreinforced material. In order for such metal-matrix nanocomposites to maintain their high strength, these materials must retain their nanostructures upon exposure to high temperatures during processing. The thermal stability of two cryomilled powders, one with and one without B_4C reinforcements in a matrix of Al 5083, was investigated. The powders were annealed at 450°C, 500°C, and 550°C for time periods of 30 minutes, 24 hours, 48 hours, and 96 hours. Average grain sizes were calculated by using established X-Ray Diffraction based methods. The average grain size for both Al 5083 with and without B_4C was found to be 18 nanometers before annealing. However, the samples that experienced the most severe annealing at 550°C for 96 hours exhibit an increase in average grain size to 66 nanometers for the powder without B_4C, but only increased to 43 nanometers for the powder with B_4C. Our investigation shows that although both powders are quite stable upon exposure to high temperatures, the addition of B_4C helps to further improve thermal stability.

Regulation of Early Cell Development in Myxococcus Xanthus

Chance R. Anderson
Sponsor: Mitchell Singer, Ph.D.
Microbiology

Myxococcus xanthus is a Gram-negative social soil bacterium that undergoes multi-cellular development by forming fruiting bodies, when nutrients become limiting. Using DNA microarrays, we have identified multiple two-component transcription factors whose expression changes within the first six hours of development. We hypothesize that some of these genes are involved in the regulation of early cell development. We will test our hypothesis by constructing null mutations in these genes and then testing the null mutants for changes in development. We made inframe-deletion mutations in the genes that encoded for these two-component transcription factors to observe how they affect early cell development. In this process we utilize different DNA protocols such as chromosome preps, electroporation, and PCR. To confirm our results we performed developmental assays and gel electrophoresis, allowing us to physically compare fruiting body development in the mutants and wild-type species, as well as make comparisons on the DNA level by visualizing the size difference in DNA between the wild-type and mutants.

Natural Disasters and Migration

Onelica C. Andrade Afonso
Sponsor: Erin Hamilton, Ph.D.
Sociology

In 1998 hurricane Mitch devastated Honduras and Nicaragua, affecting over 1,000,000 people. This was the first time the U.S. granted temporary protected status to two Central American countries due to a tropical storm. This is a clear example of extreme environmental conditions displacing people and forcing them to leave their country. Although there is historical and theoretical evidence suggesting a link between climate and human mobility, there is little empirical evidence that the environment plays a significant role in migration patterns. My research analyzes the potential relation between natural disasters and migration. To carry out the analysis, I compile data on storms, immigration and other demographic characteristics of Central American and Caribbean countries from 1980-2009. The regression analysis demonstrates that there is a significant increase in the number of immigrants coming to the U.S. a year after a severe storm or flood. These results suggest that, even though migration is a multi-causal phenomenon, the environment plays a role that goes beyond economic and political explanations. These findings indicate that a revision of migration policies in the U.S is needed and that the environment needs to be included as a cause of emigration from Central America and the Caribbean.

Detection of IAPP and $A\beta_{1-42}$ Oligomers in Serum by Water Proton Magnetic Resonance Spectroscopy

Laura Andronic
Sponsor: Florin Despa, Ph.D.
Pharmacology

Clinical and experimental data indicate preamyloid oligomers as proximate effectors of cell toxicity and cell death in several neurodegenerative diseases. Detection and characterization of embryonic molecular structures formed by amyloidogenic proteins are crucial for improving clinical strategies to alleviate devastating effects of such diseases. We used water proton magnetic resonance (MR) spectroscopy to assess changes of water magnetic relaxation in mixtures of serum and test amyloidogenic entities, such as human islet amyloid polypeptide (hIAPP) and $A\beta_{1-42}$ peptides. We used immunochemistry with conformation specific antibodies and electron microscopy to identify the most likely amyloidogenic structures associated with the magnetic relaxation signal of solvation water in these samples. Our data show that the formation of hIAPP and $A\beta_{1-42}$ oligomers increases significantly the transverse magnetic relaxation time (T2) of surrounding water. Similar concentrations of non-amyloidogenic rat IAPP (rIAPP) or scrambled $A\beta_{42-1}$ peptides in serum induce much smaller T2 changes (for rIAPP) or no T2 changes at all (for $A\beta_{42-1}$). Our study suggests that the formation of preamyloid oligomers in aqueous environments is likely to generate hyper-intense, bulk-like water magnetic signals; leading to the development of new non-invasive MR imaging protocols identifying embryonic amyloid entities related to disease.

Pyridostigmine Bromide Protection Against Acetyl Cholinesterase Inhibition by the Organophosphate Pesticide: Malaxon

Anna F. Ankirskaia
Sponsor: Barry Wilson, Ph.D.
Environmental Toxicology

The widespread use of organophosphate (OP) pesticides, such as Malaxon (MXO), the activated product of the pesticide malathion, underline the importance of adequate safety measures to protect mixers, loaders, applicators, farmers, and the public. The experiments presented here concern the carbamate pyridostigmine bromide (PB) treatment as a means to reduce the effects of the OP on farm worker exposers. Red blood cells (RBCs) from the UC Davis dairy herd were incubated with PB, MXO, and appropriate controls to investigate the extent of PB protection of acetyl cholinesterase (AChE), an enzyme present in mammalian RBCs and important for nerve impulse conduction. The RBC samples were collected, washed in saline, and assayed in triplicate using the colorimetric Ellman assay to determine AChE activity. The results confirmed that PB showed neither protection nor recovery of AChE activity in the presence of MXO, unlike other OP pesticides that showed AChE protection by PB in previous experiments. These experiments suggest that OP pesticide inhibition of AChE may have more than one mechanism of recovery.

The Effects of Exclusion on Desire for Social Dominance

Jamie Arenson
Sponsor: Cynthia Pickett, Ph.D.
Psychology

Previous research indicates that excluded individuals aggress against others in order to reestablish feelings of control (Warburton, Williams, & Cairns, 2006). However, aggression can have negative social consequences, while social dominance may serve as a more socially acceptable, non-aggressive form of control. To determine whether exclusion leads to a desire for social dominance, participants either experienced social exclusion or did not and then rated their desire for dominance in a variety of social settings. Participants engaged in Cyberball (a virtual ball-tossing game) in which they were either included or excluded in the game. (Control participants observed a non-exclusion version of the game.) Participants' subsequent desire for social dominance was assessed by having them rank their preferences for a) various pretested dominant or submissive seats, b) dominant and submissive interaction partners and, c) dominant and submissive behaviors. Although the exclusion manipulation did not significantly affect individuals' desires for social dominance, individual differences in feelings of rejection found within the control condition produced the expected pattern of results, indicating the predicted link between exclusion and social dominance.

Titanium-Catalyzed Stereoselective Synthesis of Spirocyclic Oxindoles

Gary E. Arevalo
Sponsor: Annaliese K. Franz, Ph.D.
Chemistry

Spirocyclic oxindole natural products have received considerable attention due to their biological activity and potential as therapeutic agents. Their recent emergence as "privileged structures" has prompted studies in their use as disruptors of protein-protein interactions as well as a myriad of other biological activity. This has made them especially attractive targets as they can be used as building blocks for drug discovery and development. Thus, we have developed a titanium(IV) chloride-catalyzed method to produce a novel class of functionalized oxindoles for use as biological probes. Herein we present the first regio- and stereoselective cyclization of 5-methoxyoxazoles with isatins to afford spirocyclic oxindoles in excellent yields (up to 99%) and diastereoselectivity (dr >99:1) as well as high regiocontrol (>99:1). Further functionalization of these spirocyclic oxindoles via a 'click' 1,3-dipolar cycloaddition afford a wide range of new biologically relevant triazole compounds. Current efforts for further functionalization to afford an even wider range of biological probes is discussed.

Go Big or Go Home: Why Mega-game Hosts' Housing Policies for the Urban Poor Vary Dramatically in a Globalized World

Kelly Arnold
Sponsor: Smriti Srinivas, Ph.D.
Anthropology

Mega-games such as the Olympics, World Cup, and Commonwealth games focus global attention on a single host city for several weeks of international sports competition. Despite this concentrated worldwide attention, the media, governments, and academics pay little attention to the effects of these events beyond the glimmering new stadiums, all-star athletes, and piles of future debt. In preparation for global games, host cities and governments often create and implement social policies with far-reaching consequences, typically negative, for the urban poor in informal and low-income housing. Some hosts' policies displace few individuals, are lenient towards homelessness, or offer ample substitute housing while others create aggressive policies against begging and homelessness and leave thousands of displaced individuals with nowhere to turn and few resources to counteract harsh government policies. This paper explains why Beijing (2008), Delhi (2010), South Africa (2010), and Atlanta (1996) reacted differently to pressure towards modernization in an increasingly globalized world by creating such diverse social policies towards those in low-income and informal housing. I examine hosts' use of urban space, political systems, political history, and the race and ethnicity of those affected by mega-game housing policy to help determine what accounts for host cities' often very different approaches.

An mRNA-Seq Approach to Identify Nanos1 Binding Targets

Kanaga Sundari Arul Nambi Rajan
Sponsor: Bruce Draper, Ph.D.
Molecular and Cellular Biology

The reproductive capacity of animals is determined in large part by the number of eggs a female can produce. In mammals, such as humans, new eggs are only produced in the embryonic ovary and no new eggs are produced in adults. By contrast, egg production in other vertebrates, such as fish, appears to not be limited to a discrete developmental stage but instead occurs throughout larval and adult life. The Draper lab has previously shown that the evolutionarily conserved RNA binding protein Nanos1 (Nos1) is required for continuous egg production and hypothesize that it functions to maintain a population of germline stem cells in the adult ovary. However, no mRNA targets of Nos1 have been identified. To determine targets of Nos1 in zebrafish, as well as other genes important for germline stem cell (GSC) maintenance, we used mRNA-Seq to identify genes differentially expressed between wild-type and nos1 mutant ovaries. Of the genes upregulated in the wild-type vs. mutant ovaries, 29 genes were chosen for further characterization. In this study, I used RNA in situ hybridization to determine in which cells these genes are expressed in ovaries. My results show that some of these genes are expressed in early-stage germ cells.

LRIG Proteins are Regulators of Multiple Cell Signaling Pathways Commonly Deregulated in Breast Cancer

Michael G. Astudillo
Sponsor: Colleen Sweeney, Ph.D.
Biochemistry and Molecular Medicine

Breast cancer is a leading cause of mortality among women in the United States. Cell signaling pathways are commonly deregulated in cancers and have been correlated with tumor growth and progression. These pathways can dictate when a cell needs to divide, migrate, invade other tissues, or undergo programmed cell death. The mammalian leucine-rich repeats and immunoglobulin-like domains (LRIG) family of proteins has been implicated in the regulation of multiple cell signaling pathways. LRIG1 has been shown to negatively regulate the expression of HER2, a cell membrane receptor overexpressed in about 20% of breast cancers. Less is known about the functions of LRIG2 and LRIG3. In C. elegans, a recent study identified one LRIG ortholog, SMA-10, which was determined to be involved in up-regulating Bone Morphogenetic Protein (BMP) signaling. In this project, I would like to determine which of the mammalian LRIG proteins, if any, are able to regulate BMP signaling and whether aberrant expression of LRIG proteins correlates with a deregulation of the BMP signaling pathway in breast cancer.

Exploring the Relationship Between Fatty Acid Oxidation and UCP-3 in Transgenic Mice

Massud Atta
Sponsor: Oliver Fiehn, Ph.D.
Molecular and Cellular Biology

Incomplete Fatty Acid Oxidation (FAO) may be involved in the development of insulin resistance, which can lead to the development of Type II Diabetes affecting millions of people worldwide. If we can assess the state of muscle FAO by blood-based biomarkers, future research might allow for an earlier diagnosis of the onset and progression of insulin resistance and diabetes. Current research suggests that Uncoupling Protein 3 (UCP-3) is implicated in FAO. Acylcarnitines, which function to transfer fatty acids into the mitochondria, are also used to export fatty acids out of the mitochondria to avoid accumulation of fatty acyl-CoAs when FAO is hampered. Hence, blood plasma acylcarnitines might be used as markers to determine the amount of incomplete FAO. This research explores the relationship of UCP-3 and FAO by assessing acylcarnitine levels in over-expressed UCP-3 (transgenic UCP-3) versus control (wild-type). Untrained and trained wild-type mice were compared to transgenic mice at resting conditions and directly after an exercise bout. Untrained mice show significantly higher levels of acylcarnitines after exercising. In contrast, transgenic mice displayed acylcarnitine levels similar to trained control mice regardless of physical activity.

Being Bilingual in California, a Must!

Kristy D. Ayala
Sponsor: Cecilia Colombi, Ph.D.
Spanish

In the last few decades, the Southwest has seen a continued influx of immigrants mostly from Mexico, but also from the Caribbean region and Central America; these changes in the population have also resulted in an increase in the use of Spanish. In California, for example, more than a third of the population declares to speak Spanish according to the latest census (U.S. Census Bureau). In this context, I put forward the question whether bilingual education is a necessity for our students or not. Three important reasons lead me to conclude that bilingual education is an essential necessity for our state A.) More job opportunities and better salaries for bilingual people (Gorney), B.) School advantages for heritage speakers who maintain their second language (in this case Spanish) (Cummins, Colombi), and C.) More cultural and social adaptiveness in a global society (Ramos, Zentella).This comparative study will be based on students' interviews, demographic surveys, and other data collected by the U.S. Census Bureau and the Pew Hispanic Institute. The results reaffirm the importance of bilingual education for the maintenance and development of the language.

Preparation and Biological Protective Functions of Halamine Nanofibrous Membranes

Qazaleh Bahramian
Sponsor: Gang Sun, Ph.D.
Textiles and Clothing

Functional applications of antimicrobial textiles have been of great interest especially in areas of biological protection for healthcare workers and military personnel. Previous studies showed that antimicrobial nanofibers possess improved functions due to their ultrahigh surface areas. Since nanofibers are difficult to handle they should be applied onto a more durable supporting substrate for personal protective applications. In this study we developed nanofibrous membranes from coating nanofibers evenly onto nonwoven fabrics. By using this method, poly (ethylene-co-vinyl alcohol-g-diallylmelamine) nanofibers were coated onto poly (propylene-g-diallymelamine) (PP-g-DAM) microfiber nonwoven substrate. PP-g-DAM serves as N-halamine precursor that can react with chlorine bleach to form biocidal halamine structures. Since nanofibers have a high surface area, more active N-halamine content can be resulted from the nanofibrous membranes. When challenged with *E. coli* and *S. aureus* bacteria the membranes showed excellent and refreshable antimicrobial properties. As a result, 100% and 95% reductions of *E. coli* and *S. aureus* were obtained, respectively.

Engineering Plant Resistance Against a Parasitic Weed with RNA Interference

Tamara Banda
Sponsor: John Yoder, Ph.D.
Plant Sciences

Parasitic plants have long being known to pose several threats to the growth and development of several plants. Parasitic plants have been able to survive and prey on plants because of their unique growth and host invasion mechanisms. There are several mechanisms by which parasitic plants invade their host plants in order to rob them of water, minerals and other vital nutrients. Triphysaria, the parasitic plant of focus in our research is *a* broad host range plant that recognizes and infects a broad spectrum of monocot and dicot hosts. It uses the host root via haustoria as its attachment region during host invasion. Here we will investigate the use of RNA interference (RNAi) as a genetic tool for engineering host resistance against Triphysaria. The approach will be to transform the host plant, tomato with a plasmid encoding a double stranded hair pin RNA (hpRNA) targeted against genes essential for Triphysaria survival. We will use Agrobacterium to genetically engineer the DNA, perform minipreps of the DNA, and then we'll utilize competent *E. coli* bacteria to replicate the specific DNA fragments. RNAi will be engineered from the isolated DNA and transformed into the host plant tomato.

Correlation of Conjunctival Microangiopathy with Retinopathy in Hypertension Patients

Arjun Banerjee
Sponsor: Anthony Cheung, Ph.D.
Pathology

Hypertensive retinopathy (HR) describes the adverse changes in the retinal vasculature caused by changes in hemodynamic properties associated with hypertension. Fundus photography and measurements of blood pressure are currently used for diagnosis of HR, but do not permit direct observation of the manifestation of disease. Thus, the dynamic and morphometric changes in blood vessel characteristics have not yet been observed in real-time, *in vivo* studies. It is hypothesized that hypertensive vasculopathy can be observed in the bulbar conjunctiva prior to its pathologic presentation in the retina. Computer assisted intravital microscopy (CAIM) allows for real-time, *in vivo* quantification of microangiopathy in the bulbar conjunctiva reported on a severity index (SI), directly correlating with progression of disease. It is expected that patients with HR will exhibit significantly higher SI scores than healthy controls, while hypertensive patients without overt retinopathy exhibit SI scores between those of HR patients and controls. This indicates the possibility of a pre-retinopathy time window in which early expression of vascular remodeling can serve as a diagnostic tool for early detection, and the availability of conjunctival microvasculature as an *in vivo* platform to monitor disease progression.

Olivella Shell Bead Production Experiments

Brian Barbier
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

Olivella shell beads made by Native California Indians were widely traded throughout Western North America, used as both decoration and a form of currency, and occur in large quantities in many prehistoric sites. Different bead types have distinctive spatial and temporal distributions in the archaeological record, but also likely represent different time and labor investments based on the type and number of beads individuals possessed. Experiments were performed to collect data on different stages of bead production for various bead types, to better understand the relative amount of labor required to produce the quantities of beads found in California. Replicated beads were shaped and drilled using traditionally available materials and the time required for each stage was recorded. This data will be assessed to help determine labor investments in the production of different bead types, as well as the varying efficiency of different tools and methods. This can in turn be used to evaluate differential access to labor and wealth between individuals, for example in burial lots with different bead types and quantities, as well as the role that economies of scale may have played in bead manufacture.

Utilizing Interactions and Charge Transport Within Polymer/Fullerene Mixtures to Drive the Photovoltaic Effect in Organic Solar Cells

Travis Bartholomy
Sponsor: Roland Faller, Ph.D.
Chemical Engineering and Materials Science

We re-examine by way of molecular simulation the known benefits of using polymer/fullerene derivative mixtures to achieve efficient charge transport and ultimately a voltage between the electrodes of an organic solar cell. We then seek to optimize this charge transport, which depends on parameters such as polymer chain length and orientation, by controlling the type and proportions of organic molecules in the mixture. Of particular interest is the poly(3-hexylthiophene)/[6,6]-phenyl-C_{61}-butyric acid methyl ester mixture which, when studied in its fundamental electron donor/electron acceptor role, is found to satisfy many of the prerequisites of an organic photovoltaic system. This includes the formation of a bulk heterojunction, a mixture which is suitable for both light absorption to free electrons from the semiconducting polymer and also a separation of that charge to yield a voltage. Lastly, we consider the mixture in the context of changing thermodynamic properties and in the presence of a solvent, again in order to realistically test its performance as a potential photoactive layer in organic solar cells.

Weaning Preferences at Marsh Creek (CA-CCO-548): Serial Microsampling of Nitrogen Isotopes from Dentin Collagen

Ada G. Berget
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

The length of time a child is breastfed is one measure of parental investment in an offspring, and in recent populations is known to be correlated to measures of health of individuals, such as stature and longevity. To our knowledge, these effects have not been measured in archaeological populations. We examine human teeth from CA-CCO-548 (ca. 4000-3500 BP) on Marsh Creek in an attempt to reconstruct the age at which individuals were weaned. Nitrogen and Carbon stable isotope ratios in serial samples of collagen extracted from the dentine of M1 molars allow us to estimate the age of weaning for an individual. This information is then compared to other life history data used to test several hypotheses, including 1) whether females were weaned at a later age as the intensity of plant resource use increased, and 2) whether a longer period of breastfeeding is correlated to increased stature and greater age at death.

Construction of a Cob Bench in the UC Davis Sustainable Living Learning Community to Study Davis Clay Soils as an Earthen Building Material

Brennan B. Bird
Sponsor: Frank J. Loge, Ph.D.
Civil and Environmental Engineering

When clay subsoil is mixed with sand, water, and straw, it will dry into a hard material, called cob. Cob is being considered as a potential building material for structures in the Sustainable Living Learning Community (SLLC). UCD faculty, staff, and students are currently planning the SLLC. The SLLC will include, but is not necessarily limited to, the space currently occupied by the Domes at Baggins End. This project studied the optimal composition of cob using the clay subsoil at Baggins End. This optimal mixture was used to create a cob bench whose quality and durability can continue to be studied into the future, providing a physical model of the viability of soil as a building material. Optimal structural characteristics and material composition of the cob was evaluated with test bricks. This method involved building foot-long inch-thick cob bricks composed of a variety of material ratios, and then used marks to measure shrinkage and compression and tensile tests to determine strength. Once the optimal composition was determined, the mixture was scaled up into the construction of the bench beginning early April 2011. This bench is a testament to the earthen building process and its viability for future on-campus structures.

Salvia Divinorum: Detecting Genetic Variation in Plants Propagated from Cuttings

Gurpreet K. Bola
Sponsor: Terence Murphy, Ph.D.
Plant Biology

In theory, genetic variation among asexual organisms arises from mutation, but there is a possibility of genetic recombination during mitosis, and mismatched recombination might provide additional variation in repeated DNA sequences. *In Salvia Divinorum*, DNA fragments from several generations, grown from cuttings, have been analyzed for genetic variation. The first technique involved using various combinations of random primers that match DNA at specific sequences, and amplifying the intervening DNA using a procedure called the polymerase chain reaction (PCR). The results suggest that genetic variation may indeed distinguish plants that were grown from cuttings. A supporting technique involved using a Phire Plant Direct PCR Kit where direct punches from different generations of *Salvia* were used to get DNA templates, thus avoiding the DNA isolation procedure. We plan to isolate DNA fragments from the *Salvia* genome that contain repeated sequences. Using information from these fragments, we will devise a more specific test for genetic variation along the lines of the tests used to match human DNA in forensic situations.

Establishing Cultures of Pig Tracheal Gland Cells to Analyze the Porcine Model of Cystic Fibrosis

Rachel M. Borthwell
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Physiology and Membrane Biology

Lack of the Cystic Fibrosis Conductance Regulator (CFTR) protein causes abnormally viscous secretions from airway mucous glands that contribute to the airway pathology of cystic fibrosis (CF). Due to the similarities between human and pig airways, a transgenic pig model of CF has recently been developed to try and better understand the pathology. The objective of this research was to develop pig tracheal gland cultures that became polarized, formed tight junctions, and exhibited high levels of active Cl- secretion. Pig tracheas were dissected and the liberated submucosal gland fragments were isolated in tissue culture flasks. Cells were grown until ~80% confluent and then plated onto porous bottomed inserts. Several filters and media were tested and cells were plated either immersed or with air liquid interface. Trans-epithelial electrical resistance (R_{te}) and voltage (V_{te}) were monitored every 2-3 days with a chopstick voltmeter. Once cells developed $R_{te} > 100\Omega.cm^2$, active Cl- secretion was studied with Ussing Chambers. We have successfully established cultures of pig tracheal gland cells that form tight junctions and have high levels of active Cl- secretion. The cell cultures should prove useful in determining the role of airway submucosal glands in the pathology of CF.

Intersections of Queer Identity: Middle Eastern and South Asian Americans

Jessica Bray
Sponsor: Suad Joseph, Ph.D.
Anthropology

Queer Middle Eastern and South Asian Americans negotiate multitudinous aspects of identity, ranging from gender, ethnicity, race, age, class, and sexuality. The semantics of identity become a guiding tool for identity formation for second-generation queer youth in America. I use the recorded narratives of queer individuals to show the vexed relationship between knowledge of culture, education, and multiple languages. Higher education on sexual orientation played a significant role in how individuals inhabit the hyphen of identities. While colloquial understandings of sexuality demand segmented categories of gay and straight that do not incorporate other social and economic identities, queer allows for interactions between identities and recognizes the diversity of sexual identities. Queer emerged as an all-encompassing identity for intersections between sexuality and seemingly contradictory characteristics. Instead of identifying with identities in separate categories, queer allows for one identity embracing multiple connections and relationships. Through an understanding of current research on queer identity and first-hand interviews with MESA queers, this thesis answers questions about how 'queer' allows for a negotiation between intersecting identities.

The Multicultural Experience and Marginalization of Biracial Individuals

Joanna P. Brown
Sponsor: Nolan Zane, Ph.D.
Psychology

Since the 2008 Presidential Election and resulting inauguration of President Barack Obama, increased attention has been given to the issue of biracialism. However, little is known about the multicultural and marginalization experiences of biracials, particularly among those whose racial makeup differs from the traditional binaries of black and white. Using data from 60 first-generation biracial University of California, Davis students and affiliates (ages 17-35), the present study undertakes a qualitative approach to understand the multicultural experience and marginalization encountered by biracial individuals. Within the context of their life experiences, many biracials feel privileged to have access to multiple cultures. However, many of these individuals find themselves unable to achieve a strong sense of belonging to a particular cultural group and cite a general lack of presence and recognition of other biracial individuals in dominant culture and society. Narrative accounts from these biracial individuals reveal that both marginalization and multicultural experiences contribute to the self-esteem and identity of biracials, as well as feelings of acceptance and self-worth. The positive implications of multicultural experiences, as well as the negative impact of marginalization, provide a better understanding of the biracial experience and biracialism as a whole.

Understanding Cardiomyopathies Through a Molecular Modeling Approach

Robert E. Brown
Sponsor: Aldrin V. Gomes, Ph.D.
Neurobiology, Physiology and Behavior

Troponin (cTn) is a critical regulator of muscle contraction in cardiac muscle. Cardiac troponin (cTn) is composed of three subunits, each named according to their function: cardiac Troponin C (cTnC), cardiac Troponin I (cTnI), cardiac Troponin T (cTnT); cTnC is especially important in this process because it binds to Ca2+ relieving the cTnI inhibition ultimately resulting in muscle contraction. Recent studies have demonstrated certain cardiomyopathy mutations of cTnC with altered Ca2+ binding when compared to wild type cTnC. This altered affinity of Ca2+ in cTnC can effect muscle contraction and may be a reason why these specific mutations are associated with various cardiomyopathies. It is also likely that different mutations would have varied alterations on the protein structure. Using 3-dimensional homology modeling (I-TASSER), we found that some mutations are predicted to cause minor changes in cTnC structure (Ala8Val, Glu134Asp, Asp145Glu, Gly159Asp) while other show significant changes in cTnC structure (Cys84Tyr, Asp75Tyr, Glu59Asp, Leu29Gln). These differences in structural changes are likely to be important in defining the calcium sensitivity in TnC. Correlation of these results with published changes in calcium binding allows us a better understanding the key protein-protein interactions.

Volumes of Permutation Polytopes

Katherine Burggraf
Sponsor: Jesus De Loera, Ph.D.
Mathematics

Permutation polytopes are polytopes whose vertices are determined by a representation of a permutation group, such as the cyclic group on n elements or the dihedral group on n elements. These polytopes appear in many different applications, yet little research has been done on any save the Birkhoff polytope, the permutation polytope whose vertices are based on the symmetric group on n elements. My research focuses on determining the volume of some of these less-studied permutation polytopes. These volumes can be determined by finding the Ehrhart polynomial of a given polytope, a polynomial in n which counts the number of integer points contained within the nth dilation of the polytope. My results include Ehrhart polynomials and volumes of the polytopes corresponding to cyclic and dihedral groups, a method of calculating the Ehrhart polynomial of the set of permutations of a given binary tree, a formula for the normalized volume of polytopes of Frobenius groups, a proof that the polytopes of Frobenius groups are two-level, and a proof that the polytopes associated to the even permutation groups on n elements are not two-level for n greater than five, thus characterizing the complexity of the polytopes of Frobenius groups and even permutations.

Adaptation and Fitness Level Differences in the Legume-rhizobium Mutualism in California Serpentine and Non-serpentine Grasslands

Michelle Cabrera-Ruiz
Sponsor: Douglas Cook, Ph.D.
Plant Pathology

The legume-rhizobium symbiosis is a model system for beneficial microbial plant mutualists. Although the mutualism contributes a large fraction of available nitrogen in many plant communities, little is known about whether legumes and rhizobia show local adaptation to different soil types and whether the rhizobia from the two soil environments are equally beneficial to plants. In this experiment, serpentine and non-serpentine soil genotypes of an invasive legume (***Medicago polymorpha***) was grown in symbiosis with its invasive partner rhizobium (***Sinorhizobium medicae***). We measured a suite of phenotypic traits including stem width which correlates with plant size, an important component of annual plant fitness. We found serpentine soil to be a consistently stressful environment, producing shorter plants with smaller stem widths overall. The legumes displayed trends consistent with local adaptation to soil type for some traits and the rhizobia were highly beneficial to all plants regardless of destination soil-type. Non-serpentine origin rhizobia however, were consistently better mutualists than serpentine rhizobia. In conclusion, we provide one of the first detailed studies on how heterogeneous soil type affects the local adaptation of a mutualistic relationship between co-invading legumes and rhizobia.

Survival and Epidemiology of *Escherichia coli* on Diverse Fresh-cut Baby Leafy Greens Under Model Preharvest to Postharvest Conditions

Alex B. Camacho
Sponsor: Trevor V. Suslow, Ph.D.
Plant Sciences

Sanitation is essential to the management of microbial quality and safety of fresh-cut produce. This project aims to model Escherichia coli survival on leafy greens from production through simulated post-harvest handling to determine efficiency of post-harvest sanitization with chlorine dioxide. Leafy green leaves were grown under greenhouse conditions and spray-inoculated (log 4.2 CFU/cm2) with a cocktail of generic and attenuated *E. coli* O157:H7 (attO157). Samples were harvested at commercial maturity and processed in a model washing system. Samples were stored for 7 days at 5°C under MAP. Recovery of generic *E. coli* and attO157 was conducted up to 10 days post-inoculation, following disinfection, and 7 days post-washing. qRT-PCR was utilized for the detection of attO157 populations below the limit of detection. Variability of *E. coli* attachment was monitored throughout the postharvest period. Tatsoi leaves were positive for generic *E. coli* at all time-points while detection of att0157 fell below the level of detection. Following enrichment, all samples were positive for generic *E. coli*. AttO157 was not quantifiable after 7 days post-inoculation but its presence was confirmed through molecular analysis at succeeding time-points. Acceptable concentrations of chlorine dioxide could not disinfect either non-pathogenic surrogate from the leaves under test conditions.

Comparison of the Oxidative Capacity of Skeletal Muscle in Migratory and Resident White-crowned Sparrow (*Zonotrichia leucophrys*)

Andrew Campion
Sponsor: Marilyn Ramenofsky, Ph.D.
Neurobiology, Physiology and Behavior

For migratory birds, long distance flight requires both power and fuel. In the Gambel's White-crowned Sparrow, (***Zonotrichia leucophrys gambelii***), preparation for migration involves flight muscle size increases and lipid deposition. These alterations are closely regulated by environmental factors that prepare migrants for long-distance flight; however, the ramifications of flight itself and the metabolic mechanisms associated with migration are poorly understood. In conjunction with these observed changes in the size and fat content of skeletal muscle, more efficient lipid fuel utilization of the load-bearing flight muscles has been suggested. To assess the potential for an increased oxidative capacity in the flight muscle, concentrations of the succinate dehydrogenase (SDH) enzyme within pectoralis muscle are compared to the gastrocnemius, a leg muscle that doesn't bear weight during flight. SDH concentrations have also been measured in the non-migratory congener, *Zonotrichia l. nuttalli*, at comparable times throughout the annual cycle, to confirm that modifications in skeletal muscle are a trait associated with migration and not a seasonal adjustment. Thus, it is anticipated that, through western blot analysis and histological staining, the investigation of this oxidative enzyme will help identify and elucidate the magnitude of this adaptation for long-distance flight.

Quantifying *Fmr1* mRNA Levels Throughout Development in Different Brain Regions in the Female KI Mouse Model for FXTAS

Juliana Campo Garcia
Sponsor: Robert F. Berman, Ph.D.
Neurological Surgery

Fragile X-associated tremor/ataxia syndrome (FXTAS) is a late onset neurological disorder, resulting from a CGG trinucleotide repeat expansion on the *FMR1* gene. A knock-in (KI) mouse model of FXTAS has been developed to study FXTAS. In a previous study *Fmr1* mRNA levels were found to be elevated in male mice at all age points looked at throughout development. These results provided the first evidence for neurodevelopmental abnormalities in FXTAS. Because the *Fmr1* gene resides on the X chromosome, the next step is to replicate the study using female mice. My study focuses on quantifying *Fmr1* mRNA levels in CGG KI female mice throughout embryonic and neonatal development. My hypothesis is that *Fmr1* mRNA levels will vary during development and these differences will be related to both CGG repeat length and brain region. To test this hypothesis I am using quantitative RT-PCR to obtain relative levels of *Fmr1* mRNA. I extract the entire transcriptome from brain tissue for use as a template to obtain cDNA. This cDNA serves as template in quantitative RT-PCR to obtain relative levels of *Fmr1* cDNA that directly correspond to the amount of *Fmr1* mRNA present in the brain tissue.

Are Parents Aware of their Children's Worries? Differences Between Parent and Child Reports of Young Children's Emotions

Jessica M. Campos
Sponsor: Kristin H. Lagattuta, Ph.D.
Psychology

When clinicians and researchers measure the day-to-day emotions of children under age 7 they typically rely on parents as their primary informants. Recent research from our lab (Lagattuta, Sayfan, & Bamford, 2011) challenges this practice. Not only are children as young as 4 capable of reliably reporting their anxiety symptoms, but they also hold different perceptions than those of their parents. Parent and child reports failed to correlate, and parents underestimated their children's worry and anxiety compared to child self-reports at every age (4- to 10-year-olds). The current research tests for further evidence of this parental positivity bias with parents and children of the same age range (N = 190) with three modifications: (1) parents were informed that most normal children experience some worries; (2) parents could place their responses in an envelope to increase confidentiality; and (3) parents reported their own worries. Again, parent and child reports did not correlate, and parents underreported their children's worry and anxiety compared to child reports. Parents' own worries predicted how they rated their children's symptoms. Thus, parents not only provide overly positive evaluations of their children's emotions, but they also have difficulty separating their own feelings from those of their children.

A New Proof of the Ellipsoid Algorithm of Linear Optimization

Samantha Capozzo
Sponsor: Jesus De Loera, Ph.D.
Mathematics

Linear programming is described by Howard Karloff as 'the process of minimizing a linear objective function, subject to a finite number of linear equality and inequality constraints". Linear optimization is one of the main tools of applied mathematics and economics. It finds applications in fields ranging from image processing to logistic distribution of goods. The first algorithm that was used to solve linear programs was the Simplex method, but unfortunately, it has never been proved to be efficient. Another popular algorithm is based on the Interior Point methods, but it was only in 1979 Leonid Khachiyan invented the first ever polynomial-time algorithm to solve linear programs. The algorithm is based on the geometry of ellipsoids and how a sequence of progressively smaller ellipsoids contains convex sets. In this presentation, I will present a summary of the ellipsoid algorithm and my work with Professor De Loera on simplifying the proof to make it accessible to undergraduates.

Crack Growth at Loaded Holes With and Without Residual Stresses Under Spectrum Loading

Serena E. Carbajal
Sponsor: Michael R. Hill, Ph.D.
Mechanical and Aeronautical Engineering

Maintaining the structural integrity of aircraft is strongly affected by the strength of the material surrounding rivets and other holes through which loads are transferred. Previous studies have shown that cold working these holes can slow crack growth by creating residual stresses which close the crack. The engineering models that predict crack growth use input data from tests with loads that fluctuate between fixed maximum and minimum levels. However, in typical service, loads fluctuate in a more random manner, referred to as "spectrum loading". Prediction of crack growth for spectrum loading uses methods developed and verified for materials without residual stresses. The objective of this work was to determine the degree to which these existing models apply to cold worked holes that have residual stresses. In a set of samples having a pin-loaded hole, crack growth was measured during spectrum loading. A comparison of the measured data and predicted of crack growth shows that predictions are highly accurate for non-cold worked samples and somewhat accurate for cold worked samples.

An Atherosclerotic Phantom for the Validation of a Fluorescence Lifetime Imaging Technique

Alondra Cardenas
Sponsor: Laura Marcu, Ph.D.
Biomedical Engineering

Atherosclerosis is defined by plaque accumulation within the arterial wall and there is currently no method that can determine the likelihood of plaque rupture. The purpose of this study is to use a phantom to validate fluorescence lifetime imaging microscopy (FLIM) as a technique to assess plaque vulnerability based on the chemical composition of plaque. In order to do this, multiple holes were drilled in an aluminum phantom and filled with the endogenous fluorophores found in plaque: cholesterol, cholesterol ester, collagen and elastin. Then a catheter-based FLIM system was used to acquire images of each fluorophore individually as well as images of the margins between the fluorophores. To maximize distinction between the fluorophores, three filters were used: f1: 377/50, f2: 460/60 and f3: 510/84 (center wavelength- bandwidth). The lifetime information was retrieved using a Laguerre expansion deconvolution algorithm implemented in MATLAB. Cholesterol and cholesterol ester had an average lifetime of 1.5-1.8 ns in all three filters; collagen had a lifetime of 3 ns in f1, 2.5 ns in f2 and f3 and elastin had a lifetime of 1.8 ns in all filters. This study validates the use of a FLIM technique for recognizing features of plaque vulnerability in human arteries.

Synthesis and Use of Gallium Iminopyridine Complexes for Oxidation-Reduction Chemistry

Chelsea Cates
Sponsor: Louise Berben, Ph.D.
Chemistry

The goal of my research is to use readily available main group elements, such as Gallium and Aluminum, complexed with an iminopyridine ligand (IP) as a mechanism for the reduction of small molecules, specifically Carbon Dioxide, Carbon Monoxide and Water. Reduction of these molecules may lead to the production of liquid fuels, such as methanol and hydrocarbons, in a potentially sustainable manner. Redox active complexes were obtained by stirring Gallium trichloride with iminopyridine ligand and varying stoichiometric quantities of sodium to yield complexes in two distinct oxidation states, $(IP^{-})_2GaCl$ and $[NaDME_3][(IP^{2-})_2CGa]$. These complexes show promising redox activity due to their electrophilic character and tunable redox potentials. Formation of a Gallium cation by the removal of the fifth ligand through exposure to Lewis Acids, or by oxidation of the four electron reduced product are currently being investigated. In theory, by reducing the attached ligands and placing a positive charge on the central metal atom, the metal acts as a gateway, allowing electrons to flow from the reduced ligand to the complexed small molecule. This should cause the flow of electrons to the reduction target to become significantly easier.

Settlement Patterns of Two Flatfish Species in Relation to Coastal Oceanography

Natalie Caulk
Sponsor: Steven Morgan, Ph.D.
Environmental Science and Policy

The ability of larvae to recruit into adult populations is essential for the maintenance and replenishment of marine systems. Planktonic life stages are vulnerable to uncontrolled transport throughout the ocean, which increases dispersal and limits recruitment. Offshore transport of larvae is considered to be especially likely during upwelling, a process whereby alongshore winds blow surface waters offshore and cause cold, deep water to accumulate in its place. Recruitment is thus limited to downwelling, when winds reverse direction, or when winds calm completely during relaxation. Comparing settlement timing to local physical oceanography provides insight to the mechanism of larval transport within species. Settlement dates of newly settled English sole (*Pleuronectes vetulus*) and speckled sanddab (*Citharichthys stigmaeus*) within Bodega Harbor were calculated via otolith ("ear" bones) analysis. High settlement frequencies of English sole and sanddab coincided with downwelling, supporting this as the primary mechanism of delivery into the harbor. However, continued moderate settlement during subsequent upwelling events suggests that larval recruitment is not restricted to periods of downwelling but occurs to some degree throughout different oceanographic regimes. Comprehensive studies of the oceanic processes that determine larval distributions and recruitment levels are needed to fully explain the mechanisms of larval transport.

Is Spanish a Threat or a Blessing?

Manuel Ceja Lopez
Sponsor: Ceclia M. Colombi, Ph.D.
Spanish

The center of argument revolves around Jorge Ramos' idea that "integration means to become part of a whole but does not imply the disappearance of its parts" (2004). In other words, assimilation to the American culture means understanding and reckoning the differences that bind us together as a nation of immigrants. However there are individuals like Samuel Huntington (2004), among others, who perceive immigrants and language as a threat to the American identity. Languages besides, English, along with immigrants are seen as detriment to the U.S. society. On the contrary, Jorge Ramos and Cynthia Gorney (2007) believe that languages, in this case Spanish, should be valued; they argue that language not only serves as a symbol for identity, but more importantly, it brings economic stimulus to the U.S. economy. As a result, Spanish in the U.S. is becoming the second language spoken in private and PUBLIC spaces. This research will focus on how Spanish is used and viewed in public contexts and how Spanish has expanded over the years in the U.S. The research will be confined on scholarly articles, journals, books and on professional data bases such as the Hispanic Pew Center and The U.S. Census Bureau.

Investigation of Chromosome 15q Duplication Syndrome Using Postmortem Human Brain

Samuel W. Chadwick
Sponsor: Janine M. Lasalle, Ph.D.
Medical Microbiology & Immunology

Chromosome 15q11-13 contains an imprinted cluster of genes necessary for normal neurodevelopment of which paternal and maternal deficiencies result in Prader-Willi and Angelman syndromes, respectively. Chromosome 15q duplication syndrome (dup15q) is a genetic abnormality resulting from a distinct maternal duplication of genetic information on chromosome 15. This duplication can occur as an interstitial duplication [int dup(15)] or as a supernumerary isodicentric chromosome 15 [idic(15)]. This duplication is related to multiple problems, such as hypotonia, seizures, gross motor delays, cognitive delays and it is often associated with autism spectrum disorders. Previous work in post-mortem brain samples with idic(15) showed that allelic expression of 15q11-13 genes is not based solely on the additional copies of these genes. I am expanding on this previous research, to determine the effect of the 15q11-13 duplication on protein levels from specific genes in this locus, including the ubiquitin ligase, UBE3A, and inhibitory receptor subunit, GABRB3. Human postmortem brain samples from controls and idic15 will be tested by Western blotting. My work will give important insight into relative protein level differences in idic(15) and the etiology of this genetic disease.

Piano à la mode: Underlying Social Pressures of the Parlor Piano During the 19th Century in the American Home

Erin Chan
Sponsor: Diana Strazdes, M.F.A.
Art History

During the 19th century, the parlor piano existed as a proud status symbol and a conversation piece for many homeowners. The rise in popularity of the parlor piano in the American home is evidenced in my research of satires, magazine articles, advertisements, piano sheet music and floor plans. The objective of my research is to examine (1) the underlying societal pressures to cultivate genteel musicality and (2) the financial burdens that occurred from the possession of the parlor piano. I would argue that the possession of a piano in a household's parlor suggested the musical intellect of its inhabitants. Secondly, no modern parlor existed without the fashionable showcase and entertainment of a piano. Thirdly, whether the parlor piano reflected the genuine musical interest of the owner or suggested the pianist's playing talent in performance remains questionable. Yet, in the end, one observation that is undeniable is that the presence of a piano in the American home indicated a leisurely pastime of means. Through further research, I hope to discover the origin of influence of the parlor piano and reveal both the unconscious and conscious motives of the American consumer to purchase a piano for their parlor.

Hormonal Regulation of the Hematopoietic Stem Cell Niche

Karen M. Chan
Sponsor: Karen Gerhart, Ph.D.
Microbiology

Hematopoietic stem cells (HSCs) are self-renewing progenitor cells from which all blood cells are derived. Residing in specialized micro-environments called "niches", HSCs, during hematopoiesis, generate committed progenitors that differentiate into distinct lineages of blood cells. Currently, little is known about how hematopoiesis is coordinated with other physiological processes (e.g. hormonal signaling). Studies suggest that niches may become more receptive to B and T cell support in response to HC (hydrocortisone)-induced glucocorticoid signaling. To test how the hematopoietic system is affected at the HSC and HSC niche level, the properties of HSC and its corresponding niche in HC-treated mice are assessed independently through transplantation experiments. We injected a cohort of mice with HC and divided them into two groups. Group A served as donors for HSCs that were transplanted into untreated host mice to test the potential of HC-treated HSCs to give rise to lymphoid and other hematopoietic lineages. Group B was irradiated and served as hosts for normal HSCs transplanted from untreated mice donors. Tail blood specimen was collected from 4, 8, and 20 weeks after transplant and analyzed for donor reconstitution of myeloid, B, and T lineages to assess functional engraftment by transplanted HSCs in groups A and B.

Inhibition of Farnesyltransferase with FTI-277 Exacerbates Eosinophilic Influx in Allergic Airway Inflammation

Kevin Y. Chang
Sponsor: Amir A. Zeki, M.D.
Pulmonary Medicine

The mevalonate pathway (MA) is an important cellular metabolic pathway present in all higher eukaryotes and many bacteria. In previous experiments, we have shown that simvastatin inhibits allergic eosinophilic inflammation and improves lung function in the ovalbumin mouse model by targeting the mevalonate pathway. Farnesyltransferase (FTase) is a downstream enzyme in the MA pathway that activates Ras, a small GTPase important in eosinophilic inflammation. Thus, we hypothesized that inhibition of FTase with the drug FTI-277 would attenuate allergic airway inflammation and improve lung function. Our experimental design includes sensitizing BALB/c mice to ovalbumin (OVA) over 4 weeks, then exposed to 1% OVA aerosol over 2 weeks. Mice were injected with FTI-277 (20 mg/kg/day for 14 days) intraperitoneally before each OVA exposure. Treatment with FTI-277 worsened eosinophilic and total cell lung inflammation and goblet cell hyperplasia, exacerbated airway hyperreactivity and worsened lung compliance, via inhibition of FTase in the lung. Systemic treatment with FTI-277 exacerbated allergic eosinophilic inflammation in a mouse model of asthma suggesting that inhibition of Ras activation is not a therapeutic target in asthma.

Automated Deposition of Polyelectrolyte Multilayer Films Using Airbrushes and Motorized Linear Stage

Yow-Ren Chang
Sponsor: Christopher J. Murphy, Ph.D.
Ophthalmology & Vision Science

Polyelectrolyte multilayer films (PEM), which consist of alternating nanoscopic positively and negatively charged polymer layers, have gained much importance for pharmaceutical and tissue engineering applications due to their versatility in mechanical, chemical, and surface properties. We intend to coat wound beds with PEM to change the biophysical and chemical properties of wounds and to later functionalize PEM with growth factors. We are developing an automated method of PEM deposition by using aerosolized streams of the polymer solutions, which will not only save fabrication time, but also materials. We have demonstrated proof of principal for this approach by visualizing a coating of rhodamine solution on glass substrates with fluorescence microscopy. We have determined optimized spray parameters for uniform surface coating, with a flow rate of 9.78±0.12uL/min at 20 psi and a spray distance of 80mm. We have also successfully programmed a motorized linear stage to automate the process. While previous PEM have been constructed on polydimethylsiloxane, an inert elastomeric substrate, transferring these PEM to wounds by stamping is impractical. The methods we are optimizing will facilitate integration of PEMs into wound beds.

Cytoskeletal Effects on Mitotic Chromosome Pairing

Sonia Chapiro
Sponsor: Sean Burgess, Ph.D.
Molecular and Cellular Biology

Chromosomes have specific organization during mitosis and meiosis. The pairing of homologous chromosomes in the mitotic G2 phase, following their separation in S phase, is one example of this organization. In meiosis, the pairing of homologous chromosomes is clearly required for correct division. In mitosis, the role of pairing is unclear, but pairing has been proposed to affect gene expression; moreover, failure to pair correctly can lead to cancer and other diseases. The forces that juxtapose chromosomal loci are unknown, but meiotic studies suggest the involvement of cytoskeletal elements such as microtubule structures and the actin cables surrounding the nucleus. When the microtubule inhibitor nocodazole is added to somatically growing budding yeast, cells arrest at the G2 phase. Fluorescence microscopy of these paraformaldehyde-fixed cells reveals increased homolog and sister chromatid separation. The same procedure with latrunculin B, an actin inhibitor, will be used to assess the contribution of actin cables to pairing. Imaging cells *in vivo* with three different treatments-nocodazole, latrunculin B, and a combination of the two-will be used to gain further insight on chromosome dynamics during the G2 phase.

The Euclidean Volume of the Moduli Space

Kevin M. Chapman
Sponsor: Motohico Mulase, Ph.D.
Mathematics

An Eynard-Orantin type topological recursion formula is developed to compute the Euclidean volume of the moduli space of pointed smooth algebraic curves. A topological recursion formula is a recursion formula depending on two nonnegative integers, g and n, n>0, where a quantity to be calculated with a specified g and n can be calculated using all previous quantities of value h and m, where $2g+n > 2h+m$ and are subject to the stability condition $2h+m-2 > 0$. The moduli space of pointed smooth algebraic curves is the set of all complex structures on a Riemann surface of genus g with n marked points, modulo biholomorphic equivalence and fixing the n marked points on the Riemann surface. This result about the volume is obtained through analysis of the edge removal of ribbon graphs and Laplace transformation. With the formula, it is possible to compute the Kontsevich constants, the ratio of the Euclidean volume to the symplectic volume.

Effects of KRAS Activation and P53 Deletion on Pancreatic Cellular Plasticity

Jeff Chen
Sponsor: Michael Denison, Ph.D.
Environmental Toxicology

Pancreatic Ductal Adenocarcinoma (PDAC) is fourth most common cause of cancer death in the United States. Improved understanding of the early stages of this cancer could enable interventions at a time where therapies will be most effective. The cells that give rise to PDAC have not been fully defined, although experimental studies have revealed considerable plasticity for different pancreatic cell types to interconvert their cellular identities. Notably, recent studies have shown that a subpopulation of pancreatic centroacinar cells-marked by the expression of Aldehyde dehydrogenase (ALDH)-has progenitor-like properties with the potential to give rise to both exocrine and endocrine lineages. Here, we used published protocols (Rovira et al., Proc Natl Acad Sci U S A. 2010 Jan 5;107(1):75-800) to isolate ALDH+ centroacinar cells and examined the effect of the common gene mutations found in PDAC on the clonogenic growth of the cells. We found that activating KRAS mutations and p53 inactivation both significantly enhanced the growth of ALDH+ cells as spheroids. These cells represent a potentially powerful tool to elucidate mechanism of transdifferentiation in the pancreas and may help to more fully define how key oncogenic mutations drive PDAC initiation.

Antisnake Behavior of Wild California Ground Squirrels is Not Affected by Female Reproductive Status

Melody Chen
Sponsor: Richard Coss, Ph.D.
Psychology

Prior research indicates that wild California ground squirrels (*Spermophilus beecheyi*) behaved aggressively during laboratory presentations of their primary snake predator, the northern Pacific rattlesnake (*Crotalus oreganus*). Such aggressiveness likely reflects the space limitation of the laboratory. Except for maternal females, squirrels studied in the wild investigate rattlesnakes more cautiously. In the current field study conducted, we presented a tethered rattlesnake or an upright beer bottle as a novel object to maternal females, nonmaternal females, adult males, and pups recently emerged from burrows. This field study simulated the natural condition in which rattlesnakes hunt newly emerged pups. We hypothesized that maternal females would be the most assertive as characterized by their distance of closest approach, percentage of time spent close, percentage of time spent facing the rattlesnake or beer bottle, and their rate of alarm calling. Analyses of data revealed no reliable differences among the squirrel groups, or between the rattlesnake and novel object. Alarm calling, however, occurred only during presentations of the rattlesnakes, illustrating the provocative aspects of rattlesnake detection near burrows. Failure to detect group differences in this study might reflect the high rate of pup predation by rattlesnakes and the frequency of natural encounters at the test site.

Counterexamples to the Hirsch Conjecture

Rex C. Cheung
Sponsor: Jesus De Loera, Ph.D.
Mathematics

A *d*-dimensional polytope is a geometric object with flat sides defined by *d*-dimensional linear inequalities. In May 2010, Professor Francisco Santos disproved the long standing conjecture: the Hirsch Conjecture. This conjecture says that the diameter for any *d*-dimensional polytope is no more than *n - d*, where *n* is the number of facets of the polytope. The counterexample is based on a 5-dimensional prismatoid, a special type of polytope having two parallel facts containing all its vertices. With the one-point suspension operation, this prismatoid can be transformed into a 43-dimensional polytope with 86 vertices and diameter 44. This is a big discovery; however, this polytope is too huge that we cannot recover all its actual vertex coordinates. We attempt to look for smaller counterexamples using different methods, including constructing them explicitly, using techniques from graph theory and abstractions of polytopes. We also explore the graph of Santos' prismatoid to see what makes it so special. Lastly, we perturbed this prismatoid such that all its facets are simplicies and investigate its graph.

Screening Rice Mutant Genes for Increasing Sugar Yields in Bioenergy

Johnny Chin
Sponsor: Mawsheng Chern, Ph.D.
Plant Pathology

The decrease in the world's supply of fossil fuels necessitates the world's search for renewable sources of energy. One particular area, bioenergy, holds great promise in addressing this concern. Scientists have focused their attention on switchgrass due to its high potential in being converted from lignocellulosic biomass into ethanol, a form of bioenergy that can be used in current and future vehicles. Our lab is analyzing the cell walls of rice 'which is under the same family (Poaceae) as switchgrass' for mutants with altered cell wall compositions that will allow us to discover and understand the genes associated with the cell wall biosynthesis pathway. We self-crossed 10,000 samples of fast neutron mutagenized rice (FN). The second-generation progeny are harvested, grinded, and tested for sugar yields. We look for mutant plants that have high sugar yields, which is a desirable trait for bioenergy feedstocks. These mutants are likely to have mutations in cell walls that make them easier to be broken down into monosaccharides for alcoholic fermentation. By analyzing the genes involved in the biosynthesis of these cell walls, scientists may develop genetically modified feedstocks easier to be converted into bioenergy.

Understanding Our Current US Financial Crisis: What Went Wrong and the Next Steps

Rebecca M. Cho
Sponsor: Bagher Modjtahedi, Ph.D.
Economics

Our present financial crisis that started in 2007 impacted the world so greatly that it has been compared to the Great Depression of the 1930s. Economists continue to strive for solutions to fix the crisis by exploring mistakes of major financial leaders and institutions. The objective of this research is to analyze and understand the chain of events that led the US economy into its current state, along with proposed solutions that will lift the economy out of this financial blunder. Through close analysis of published works by leading economists, I will discuss the following issues that triggered the crisis: (1) the originate and distribute banking system; (2) the issues within securitization; and (3) the effects of housing and credit bubbles. Lastly, I will discuss possible solutions to stabilize our economy as proposed by various economists, which include: focuses on US education with emphasis on the fundamentals of finance, reconstructing bank incentives, and loan modifications. Overall, the current status of our economy is a very important topic to learn from, and I hope to bring awareness to these key issues to avoid another financial crisis in the future.

The Role of Reactive Oxygen Species in Modulation of p21 Activated Protein Kinase Activity

Ezen Choo
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Environmental Toxicology

Oxidative stress is a common component of age-related cardiovascular and neurological diseases and several cancers. While the underlying mechanisms of biological effects of oxidative stress are not fully characterized, chemical protein modifications by oxidants can trigger functional consequences such as deleterious alterations in protein activity. We aimed to detect the cysteine redox status of p21-activated kinase (Pak) protein family members under normal and oxidative conditions to determine if the protein class is likely to be redox-regulated. The chosen proteins (Ste20, Cla4, and Skm1) play important roles in cellular processes of *Saccharomyces cerevisiae* (yeast) and share structural and functional similarities with their human counterparts. We hypothesize that H2O2 exposure will result in increased cysteine oxidation in the Pak protein kinases and potentially lead to altered protein function. To test the hypothesis, we observed cysteine oxidation states using cysteine-reactive chemical probes. Mass shifts on immunoblots using primary antibody directed against TAP-tagged Pak proteins indicate probe incorporation. Increasing cysteine oxidation results would provide enough evidence to perform functional assays. Determining how Pak proteins may be influenced by the redox environment will determine whether or not they may serve as therapeutic targets for a variety of oxidative stress-related pathologies.

Identifying the Abundance of Yeasts, Levels of pH and Salinity in Spoiled Sicilian-Style Olive Fermentation

Elaine S. Chow
Sponsor: Kyria Boundy-Mills, Ph.D.
Food Science and Technology

Most of the table olives produced in the US are grown in California. In 2007, a spoilage event occurred at Sicilian-style olive processing facilities. It was hypothesized that pectinolytic activity of microbes caused the olive flesh to soften. The spoiled olives were found to contain significantly higher amounts of microbes, and different species of yeasts, compared to the unspoiled olives. Yeasts in the spoiled olives were found to be pectinolytic in a radial diffusion assay. In a trial initiated November 2010, we are replicating the softening of the spoiled olives by inoculating pectinolytic yeasts isolated from spoiled olives (*Issatchenkia orientalis, Pichia manshurica, Candida boidinii, and Saccharomyces cerevisiae*) to olives in brine in small scale fermentations. Counts of pectinolytic yeasts are being determined by plating dilutions of brine and olives. Yeast counts (CFU/gram macerated olive) increased significantly in the early stages, then declined. Average yeast counts in brine (CFU/mL) remains relatively constant. The levels of pH and salinity have declined slightly over time. Abnormally high levels of pectinolytic yeast species may be the cause of softening in the spoiled olives.

Coping with Difference: Social Identity and Mediating Intergroup Conflict in Octavia E. Butler's Science Fiction Novels

Stephanie S. Chow
Sponsor: Mark C. Jerng, Ph.D.
English

The genre of science fiction has the tendency to analyze strictly the human-alien encounter and less often assesses the intra-human relationships that develop in such a displacement. Within this constructed world, the unconscious dimensions of identity make their presence felt in the encounter with difference. Recognizing difference and adopting identities deemed valuable or possible ultimately shapes how we view the self and cope with identity formation. However, our struggle in this process of appropriate self-recognition and recognition by others is enough to create intergroup conflict. Focusing on theories in social identity and group identity, I am examining narrative techniques that Octavia E. Butler employs in her novels, such as free indirect discourse in Dawn and first-person narration in her Parable series, in order to explore how Butler's stories test our assumptions of what it means to relate to another. I will investigate frameworks of opposing identities and differentiated subgroups in her texts and the way power dynamics are constructed based off of these oppositions. Through this project, I hope to better understand the role that science fiction can play in uncovering the principles grounded behind effective conflict resolution and how they can be translated across time and disciplines.

A Novel Method to Capture Stable Genomic R-loops *In vitro*

Holly C. Christensen
Sponsor: Frédéric L. Chédin, Ph.D.
Molecular and Cellular Biology

Cytosine DNA methylation represents a prevalent modification in the human genome. It is essential for the normal function and differentiation of human cells and for the stability and organization of the human genome. Despite its importance, the mechanisms by which genomic methylation patterns are established remain to be fully understood. We have proposed a hypothesis to account for the ability of certain genomic regions to remain protected from DNA methylation. This hypothesis proposes that R-loop structures, which are composed of both RNA and DNA and form during transcription, are responsible for mediating this protection. Here we describe a method that enables the capture of genomic R-loop structures *in vitro*. This method makes use of an engineered protein that binds specifically to R-loops. Protein-bound R-loops can then be pulled-down by virtue of the presence of affinity tags on the protein and isolated from the remaining genomic DNA. Isolated R-loops can then be further characterized by various methods including high-throughput DNA sequencing, enabling us to reveal precisely where these structures are forming in the human genome. We expect that this data will provide insights into the mechanisms that establish DNA methylation patterns, revealing a novel level of structural regulation in human cells.

The Role of GGDEF-Domain Genes in *Myxococcus Xanthus* Development

Sean Christiansen
Sponsor: Mitchell Singer, Ph.D.
Microbiology

Our goal is to identify regulatory components of the developmental pathway of *Myxococcus xanthus. M. xanthus* is a Gram-negative social soil bacterium that forms multicellular fruiting bodies in response to limited nutrients. During this process, cells differentiate and undergo physiological changes, forming resistant myxospores in 24 to 48 hours. We have identified several GGDEF-domain genes involved with the production of cyclic-di-GMP. GGDEF-domain genes control the production of a highly-conserved signal molecule consisting of glycine, aspartic acid, glutamic acid and phenylalanine. This small signaling molecule is used in other systems to control metabolism, cell differentiation and motility. Our working hypothesis is that these GGDEF genes play an important role in the congregation of *M. xanthus* and the formation of fruiting bodies under stressful conditions. Using DNA micro arrays, we have identified eight GGDEF-domain genes whose expression changes during nutrient limitation. We made eight in-frame deletions and confirmed their location by PCR. The resulting mutants are currently being screened for multiple developmental phenotypes including fruiting body formation, sporulation efficiency, motility and developmental gene expression.

Gene Regulation in Human Epithelial Cells in Response to Bacterial Toxin

Karen L. Chu
Sponsor: Reen Wu, Ph.D.
Anatomy, Physiology and Cell Biology

Pore-forming toxins introduce pores in cell membranes, lead to the death of the cell, and cause overall tissue damage. Among these toxins is the largest bacterial virulence protein family called pneumolysin, a cholesterol-dependent toxin produced by *Streptococcus pneumoniae*, involved in causing pneumonia as well as other medical health problems. Due to the lack of novel antibiotics, there is a desperate need for new antimicrobial agents. Since pneumolysin is a critical virulence factor in *S. pneumoniae*, it is plausible that protecting cells against pneumolysin attack could lead to resistance to *S. pneumoniae* infection. My research project is to establish a panel of genes that are transcriptionally regulated upon pneumolysin treatment in human airway epithelial cells. With quantitative reverse transcription-polymerase chain reaction (RT-PCR) technique to optimize the time course and dose response of pneumolysin treatment in human airway epithelial cells, we then could further use this readout to screen for the drugs that could lead to the change of the pneumolysin-response gene expression and further protect the cells against pneumolysin.

The Effects of Varying Calcium and Boron Supplied to *Lactuca Sativa* on *In planta* Transgene Transient Expression Following Agroinfiltration

Joshua T. Claypool
Sponsor: Jean VanderGheynst, Ph.D.
Biological and Agricultural Engineering

Improving the efficiency of agroinfiltration has potential to improve high-value protein production *in planta* for pharmaceutical and enzyme industries by offering an alternative to cell-culture based expression systems. Agroinfiltration is a technique that uses *Agrobacterium tumefaciens* to transfer DNA to plant cells for *in planta* protein production. This study aims to detect variations in transgene transient expression levels of recombinant β-glucuronidase (GUS) in *Lactuca sativa* var. valmaine, following agroinfiltration, due to varying concentrations of calcium and boron supplied during growth. Limited knowledge exists regarding *A. tumefaciens'* interactions with the plant cell wall during agroinfiltration and how these interactions are affected by trace elements. Calcium and boron were chosen because of the key roles they play in plant cell wall assembly. By supplying high, middle, and low concentrations of calcium and boron during growth, the study investigates the main, second order, and interaction effects with regards to agroinfiltration competency. The study uses a strain of *A. tumefaciens* that codes for GUS on the T-strand, the DNA transferred during agroinfiltration, that allows for quantification of *in planta* recombinant protein levels using a colorimetric activity assay. Higher levels of GUS production indicate higher transient expression levels and an improvement in overall transformation efficiency.

Do Gravitational Lenses Lie on Biased Lines of Sight?

Megan A. Clendenin
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Physics

Gravitational lenses are rare and interesting objects that can be used by astrophysicists to measure the properties of galaxies and of the Universe. However, in order to use them this way, we need to know if the amount of mass between us and these rare objects is typical of the Universe or if lenses lie along special lines of sight. To study this, I compared the number of galaxies in images containing lenses with those in randomly placed images on the sky. I downloaded catalogs from the Canada France Hawaii Telescope Legacy Survey (CFHTLS), which has collected data from a large area of the sky. I created a grid of circular apertures using the CFHTLS data and found the number of galaxies in each aperture as a function of the brightness of the galaxies. I repeated this process with circular apertures that were centered on the roughly 20 gravitational lenses that are known in the CFHTLS. I will present the results of this comparison.

Effects of Oxygenated Drinking Water on Gaseous Emissions, Rumen Microorganisms and Milk Production in Dairy Cattle

Mathew D. Cohen
Sponsor: Frank M. Mitloehner, Ph.D.
Animal Science

Dairy cattle production systems contribute to greenhouse gas emissions, predominantly in the form of methane. Enteric methane is formed by methanogenic archaea (methanogens) that require anaerobic conditions to thrive. A water treatment system increases the dissolved oxygen concentration in drinking water. We hypothesize that by increasing the dissolved oxygen concentration of the rumen through intake of oxygenated drinking water, one creates an environment detrimental to the proliferation of methanogens. The present study evaluated carbonaceous and nitrogenous gaseous emissions in addition to performance parameters. Thirty-six lactating Holstein dairy cows were used in a completely randomized design. The cows were assigned to two treatment groups: control water and oxygenated drinking water. The cows were housed in three groups of six animals within each treatment (n = 3). Dry matter intake (DMI), water intake and milk yield were recorded daily. Rumen fluid samples were extracted via an orogastric tube and quantified for bacteria, methanogens and protozoa. Cows were placed inside an environmental chamber to measure carbon dioxide, nitrous oxide and ammonia. The DMI, water intake and energy corrected milk yield were similar but OXI vs. CON treated cattle showed decreased milk yield ($P<0.01$). Bacteria, methanogen and protozoa quantification yielded no significant differences. While methane production was similar, ammonia emission increased for OXI vs. CON treated cattle ($P<0.05$). Introduction of excess oxygen to the rumen via drinking water did not produce the anticipated effect on methane reduction but instead seems to cause changes in nitrogen cycling of the animal which deserves further investigation.

Estimating Ground Reaction Forces During Locomotion in Adults 18-25 Years Old from Biotrainer and ActiGraph Activity Monitor Data

Kelsey H. Collins
Sponsor: David A. Hawkins, Ph.D.
Neurobiology, Physiology and Behavior

Physical activity monitors are small devices often worn on a person's hip to quantify their frequency, duration, and intensity of physical activity. These data are then used to estimate the person's energy expenditure. Recently, efforts have been made to use these devices to estimate the ground reaction forces acting on the body during gait. The ability to estimate ground reaction forces throughout daily activities is important for understanding musculoskeletal loading and injury mechanisms. Members of the UC Davis Human Performance Laboratory recently derived a regression equation to estimate peak vertical ground reaction forces for children 10-14 years of age during walking and running tasks using a Biotrainer Activity Monitor (IM Systems, Arnold, MD). The purpose of this study is to derive similar equations for young adults 18-25 years of age based on Biotrainer and ActiGraph Activity Monitor (ActiGraph LLC, Pensicola, FL) data. Activity monitor data will be collected along with ground reaction forces during locomotion and jumping tasks. Regression equations will be generated to estimate the ground reaction force from each monitor's data in a free-living situation. The accuracy of each regression equation for predicting ground reaction forces will be evaluated and compared.

Comparing the 3D Morphology of Cambrian Thrombolites

Brook M. Constantz
Sponsor: Dawn Y. Sumner, Ph.D.
Geology

Thrombolites are growth structures of microbial and algal communities that form from a combination of microbial processes, sedimentation, and lithification. These structures are characterized by their clustered, clotted morphology. However, some preserved burrowed marine muds look similar to thombolites, making it difficult to identify true microbial growth structures. This study aims to identify features of Cambrian thrombolites that distinguish them from other structures. Once ancient thrombolites are reliably identified, they can then be analyzed in detail to better understand ancient paleoecology. Serial sectioning is a technique for examining the 3D structure of microbialites. Evenly spaced digital scans were rendered into a volume in the KeckCAVES, creating a 3D model. The 3D thrombolite models revealed complex structures including web-like connections not visible with two-dimensional images of rock surfaces. Both samples share characteristics such as larger web-like connections and clotted structures within bounding ellipsoidal shapes. However, sample NP clots form large web-like connections and clearly bounded ellipsoidal shapes that are sub-parallel in plane view. Sample CF clots have both large and small connections, a more clotted morphology with less defined boundaries, and are not sub-parallel. The morphological characteristics observed in 3D may provide a useful tool for identifying more thrombolites.

The Response of Aquatic Macroinvertebrate Water Quality Metrics to the Exclusion of Grazing Cattle

Nicholas J. Corline
Sponsor: Sharon P. Lawler, Ph.D.
Entomology

Cattle grazing is known to be damaging to stream morphology and water quality; it is logical that aquatic macroinvertebrate metrics should mirror these perturbations. Research into the effects of cattle-caused disturbances to invertebrate water quality measures has not been conclusive. As cattle physically and chemically change stream conditions, invertebrate communities should respond with an increase in abundance of tolerant taxa, and shift in functional feeding groups. This study measured the response of aquatic invertebrates to the exclusion of cattle grazing by measuring aquatic macroinvertebrate water quality metrics and functional feeding group designations. We compared these measures to data obtained from the previous year, prior to cattle exclusion. With exclusion of cattle, organic pollution, erosion/siltation, and resource inputs should change and thus have an influence on the invertebrate community. We found that within one year of cattle exclusion macroinvertebrate-based water quality measures improved, showing a shift from tolerant to sensitive taxa. Trends in functional feeding groups were also observed. The results were surprising as there was only a year between the time of grazing and exclusion; this shows a rapid change in the aquatic macroinvertebrate community. Such changes suggest that grazing cattle negatively affect the aquatic invertebrate community.

The Effects of Thermal Stress on *Chlorostoma* Congeners, *Funebralis* and *Brunnea*, Regulation of Hsp 70 and Interactions with Biofilms

Sarah A. Covello
Sponsor: Gary Cherr, Ph.D.
Environmental Toxicology

The rocky intertidal is a ruthless world; a place where life must survive daily battles with their neighbors and the environment. Temperature is one abiotic factor controlling the distribution and population of organisms. In the presence of thermal stress, many organisms protect themselves by generating heat shock proteins (Hsp) in order to refold denatured proteins. The two *Chlorostoma* congeners used in this study originated from two different thermal habitats, the subtidal to low-intertidal and mid- to high- intertidal of rocky shore. When I exposed snails to thermal stress and a mat of biofilm, there was a change in their feeding behavior. Since we know that temperature has a significant effect on the metabolic rate of ectotherms, such as marine snails, and tissues preferentially increase their expression of Hsp in the face of thermal stress, there might be a correlation between the a change in feeding time and physiological responses. Compared to *Chlorostoma funebralis, Chlorostoma brunnea* demonstrated a more significant change in moving and eating after experiencing a heat shock. Changes in feeding behavior and the amount of biofilms were discovered in this study, but an increase in Hsp was not detected, contrary to many previous studies.

Measuring Chromatin Structure of Chromosome 15 by DNA FISH in Aicardi-Goutieres Syndrome Cells

Florence K. Crary
Sponsor: Janine LaSalle, Ph.D.
Medical Microbiology & Immunology

Allelic chromatin differences have been seen at a region of chromosome 15 important in neurodevelopment, and the chromatin differences are hypothesized to be the result of an unusual RNA:DNA hybrid that forms in the region on one allele. However, the effect of RNA:DNA hybrids (also called R-loops) on the structure of chromatin is not known. Aicardi Goutieres Syndrome (AGS) is a genetic disorder caused by mutations in genes encoding for RNAse H, thus neutralizing a cell's ability to break down RNA:DNA hybrids. This study looked for altered chromatin structure in AGS cells that may be due to increased DNA-RNA hybrids. By utilizing DNA FISH, two regions on a section of chromosome 15 were visualized and measured in fibroblasts. One region is hypothesized to be prone to R-loop formation due to a high G content in the coding strand, as R-loops form when a G-rich RNA hybridizes to its complementary C-rich DNA. A comparison between the chromatin structures in wild type cells and AGS cells showed that AGS cells have increased DNA decondensation at an R-loop prone region, but not at a control region.

The Effects of Progesterone and Estradiol on HIV-1 Coreceptor Expression and Epithelial Integrity Using *In vitro* Cell Models

Sean S. Crawford
Sponsor: Barbara L. Shacklett, Ph.D.
Medical Microbiology & Immunology

Factors affecting HIV-1 transmission at mucosal sites include the availability of susceptible cells and the integrity of the epithelial layer. HIV receptor and coreceptor expression in the female reproductive tract have been shown to change during phases of the menstrual cycle and cycle-related changes in epithelial barrier function may also occur. To test whether progesterone and/or estradiol directly influence the expression of HIV coreceptors and induce changes in the epithelial layer, cell lines were used as an in-vitro model in this study. Expression of CD4, CCR5, and CXCR4 was measured using flow cytometry on both T-cells and epithelial cells. Epithelial integrity was measured using electrical resistance and Blue Dextran dye. Coreceptor expression did not change in any of the three T-cell lines (A3.01, CEM T-4, and T2) or in the epithelial Caco-2 cell line when treated with individual and combined hormones for 48hrs. In contrast, preliminary results indicated a hormone related change in the permeability of the Caco-2 epithelial monolayer. Thus, progesterone and estradiol may not directly change the expression of coreceptors for HIV infection but may play a direct role in altering epithelial barrier function.

Electrically Modulated Partial Coalescence of Oppositely Charged Droplets

John C. Creasey
Sponsor: William D. Ristenpart, Ph.D.
Chemical Engineering and Materials Science

Electric fields can control liquid drop movement. This phenomena is seen in lab-on-a-chip manipulations, dehydration of petroleum and olive oil, electrowetting, ink-jet printing, and electric cloud formation. More specifically electric fields can cause two oppositely charged drops to coalesce at low field strengths, and fail to coalesce above a critical field strength. Here we report a technique to externally control the extent a charged droplet is allowed to coalesce. For sufficiently low ionic conductivities, the degree of coalescence of water drops in oil can be tuned from complete coalescence at low field strengths to complete non-coalescence at high field strengths. Strikingly, in this regime the size and charge of the daughter droplet are both independent of the drop conductivity. We present evidence that the charge transfer is instead dominated by convective effects associated with the capillary-driven penetration of a vortex into the larger drop. Moreover, we demonstrate that measurements of the size of the daughter droplet are consistent with a model based on a balance between capillary forces and electrostatic repulsion. Precise control of coalescence with electric fields should allow more controlled techniques of lab-on-a-chip manipulation.

Roman Historical Narrative: The Etruscan Background

Ashleigh L. E. Crocker
Sponsor: Lynn E. Roller, Ph.D.
Art History

During the first millennium BCE, the Etruscans were the dominant people in northern Italy. Yet an evaluation of their culture continues to be difficult because of a lack of information on their origins, language, and history. The numerous tomb paintings found near the Etruscan cities Tarquinia and Vulci from the 4th and 3rd centuries BCE offer historians an opportunity to evaluate how the Etruscans viewed themselves during a critical moment in their history when they were under pressure from Rome. The François Tomb at Vulci and the Tomb of the Shields and Tomb of Orcus at Tarquinia use distinctly Greek techniques mixed with Etruscan motifs to create the most mature tomb paintings in Etruscan art that mix historical figures and events, natural environments and legendary narratives. The tombs show narratives and banquets that compare Etruscan history with Greek legends. Peter J. Holliday's research on the François Tomb, Massimo Pallottino's examination of Etruscan art and Robert Ling's analysis of Roman paintings will help to demonstrate that even though the Etruscans used Greek techniques to create the tomb paintings, figures, themes and landscapes depicted in these tombs create a purely Etruscan visual form that helped shape later Roman Art.

Utilization of Biogas for Cooking Fuel in Rural Nicaragua

Michael Cunningham
Sponsor: Kurt Kornbluth, Ph.D.
College of Engineering

This report investigates the feasibility the filtering and compressing biogas for cooking fuel in rural agricultural communities on the Atlantic Coast of Nicaragua. Farmers currently spend approximately 11% of their income on imported natural gas or charcoal produced from local forests. Biogas from agricultural waste is a sustainable alternative cooking fuel could provide economic benefit to customers and local farmers. The current market price [illegible] ral gas and charcoal as a cooking fuel [illegible] per household is $2-6 per month. To [illegible] charcoal, the biogas must be an effective [illegible] cost cooking fuel. This report determines the feasibility of installing a low cost water scrubbing system at the Wawashang agricultural school in Pearl Lagoon, Nicaragua. The filtration and compression system removes carbon dioxide and hydrogen sulfide from biogas to increase methane content. The removal of these impurities gives the biogas a similar heating value as natural gas. The report investigates different off grid electricity generation technologies for the water scrubbing system. The alternatives include: photovoltaic systems, diesel generators, and biogas generators.

CANCELLED

Expression of Components of the GABAergic Pathway in Fragile X Syndrome

Ravi Dandekar
Sponsor: Flora Tassone, Ph.D.
Biochemistry and Molecular Medicine

Fragile X Syndrome (FXS) is the most common inherited form of intellectual disabilities caused by a trinucleotide CGG expansion in the promoter region of the *FMR1* gene with a consequent gene silencing and absence of the encoded product, FMRP, which is important for brain development. Recent studies, utilizing the FMR1 KO mouse model of FXS, have demonstrated reduced gene expression for components of the GABAergic system, one of the most important inhibitory pathways in the brain. The GABAergic system is crucial for the regulation of inhibitory pathways that in turn regulate the signal transduction of neurons. We hypothesized that impairment of GABAergic pathway could correlate with the clinical manifestations of the FXS. We determined the gene expression levels of the 4 major GABA(A) receptor subunits (α, β, δ and γ), as well as rate-limiting enzymes in the GABAergic pathway by using real-time PCR on totRNA isolated from the cerebellum and frontal lobe post mortem tissue of 4 patients with FXS. We found no significant differences in the expression levels of these genes when compared to age matched controls. Since our sample size was small (n=4), a larger sample size is necessary for future research.

Heart Disease in Women: Strategies for Risk Reduction

Kristin Dang
Sponsor: Amparo Villablanca, M.D.
Cardiovascular Medicine

Cardiovascular disease (CVD) is the leading cause of death in women and accounts for 500,000 deaths annually. Awareness about the risk factors and effective preventive interventions is low. Certain populations, such as African-Americans, have a higher risk due to socioeconomic background, lack of education models, and other factors. The Villablanca lab conducted a comprehensive community-based participatory study to implement a CVD prevention program in Sacramento in partnership with a national community organization serving African-American women. The study found that a community based preventive program improved heart disease knowledge that translated into improved heart healthy behavior and risk reduction. 32 women completed 4 months of biweekly informational workshops that focused on education about CVD risk factors and heart healthy habits including diet and exercise. Clinical measurements and self- report standardized surveys were analyzed. This poster is focused on the impact on lowering total cholesterol (TC) and triglycerides (TG). Pre/post data analysis showed a significant increase in participant knowledge for lowering TC and TG. Participants also reported an increase in overall knowledge of CVD risks and a positive change in lifestyle choices. This study demonstrates an effective educational model for CVD risk reduction that can be implemented in communities.

Individual Differences in Grooming Patterns Among Rhesus Macaques (*Macaca mulatta*)

Dinah R. Davison
Sponsor: John P. Capitanio, Ph.D.
Psychology

Rhesus macaques (*Macaca mulatta*) are cercopithecine primates that live in large, multi-male multi-female groups with strict matrilineal dominance hierarchies. Grooming plays an important role in strengthening social bonds and maintaining group stability. This study examines how directionality of grooming and proportion of time spent grooming relate to rank and temperament in rhesus macaques. Data was collected from September to November 2010 at the California National Primate Research by conducting group scans at a field cage containing 180 macaques. The identities of all adults engaged in a grooming with one or more partners were recorded. Personality data was previously collected by reliable observers and scored in four main dimensions: confidence, sociability, equability and excitability. These personality data plus rank information will be analyzed using Excel. I project the study will find that rhesus monkeys that are higher in rank will be groomed more often than their lower-ranking peers and that individuals with primarily sociable or equable personalities will engage in grooming bouts more often than those who are primarily confident or excitable. This research could fill in some of the gaps in our knowledge about personality influences primate social behavior.

Sex Differences in Lung Toxicity from 1-Nitronaphthalene: Role of Microsomal Epoxide Hydrolase (mEH)

Rose Ann M. De Guzman
Sponsor: Laura S. Van Winkle, Ph.D.
Vet Med: Anatomy, Physiology, and Cell Biology

1-Nitronaphthalene (1NN) is an abundant airborne environmental pollutant produced by combustion. 1NN is bioactivated by cytochrome P450 to a reactive epoxide that injures the lung. We hypothesized that microsomal epoxide hydrolase (mEH) would be involved in detoxification of the INN intermediate. To address this, male and female mice that lack mEH (KO) or wild type (WT) mice were injected with 1NN (50 and 100 mg/kg). The lungs were removed and processed for high resolution light microscopy. Mass of vacuolated cytotoxic epithelial cells in terminal bronchioles was quantified. Female KO and WT mice show a dose response; whereas, male KO mice show a dose response, but WT mice do not. Female WT mice had significantly higher injury than male WT at 100 mg/kg dosage, but no significant difference was found between female and male KO. In comparing WT and KO for each sex at 100 mg/kg, male KO had more injury than male WT mice. However, no difference was found between female KO and female WT. We conclude that 1) loss of mEH increased cytotoxicity in males, but not females and 2) regardless of genotype, females had significantly greater cytotoxicity compared to males. Support: FAMRI, TRDRP, NIH.

The Victorian Governess: Subversive Representation, Ideology, and the Poetics of Hybridity in *Emma*, *Jane Eyre*, *Vanity Fair*, and *Lady Audley's Secret*

Paul De Morais
Sponsor: Elizabeth Freeman, Ph.D. English

Historian Katherine Hughes notes that social conditions and possibilities for nineteenth century governesses were far worse than the romanticized accounts of governesses in novels such as Charlotte Bronte's *Jane Eyre* and William Makepeace Thackeray's *Vanity Fair*. Nonetheless, many during this period felt anxiety towards the possibility that the governess' unorthodox female role would allow for unsanctioned upward class mobility. This project investigates why several aesthetic representations of governesses in nineteenth century novels, particularly Victorian ones, differed so greatly from the factually poor conditions that governesses endured. It argues that nineteenth century authors found in the governess a powerful figure: she moved across classes, and in undergoing employment within foreign households she paradoxically entered into the masculine public domain of work, thus uniting the categories of feminine, masculine, private, public, domestic, and foreign. Authors who wrote of governesses could therefore challenge the separationist and essentialist ideologies that dominated the time period, and by extension could use the governess to connect foreign colonial situations with domestic politics-drawing parallels between the two and undermining the artificial pretensions of the ruling class, whether it was the colonizer, patriarchal man, or the bourgeoisie, while transforming traditionally gendered narratives like the love plot.

How Positive Affect Can Improve Memory

Monique A. Derossett Mendonca
Sponsor: Wesley G. Moons, Ph.D.
Psychology

Previous research on the own-race bias (ORB), the tendency for people to remember faces from their own race better than faces from another race, has investigated the individual effects of mood, expression, and race on memory for faces. However, this research has failed to combine these factors. The current study seeks to remedy this gap. Undergraduates are randomly assigned to either the neutral or happy mood condition (write about what you did yesterday or a happy memory). During the encoding phase, all participants see smiling and non-smiling White, Black, and Indian faces for two seconds. Then participants complete distracter tasks. Finally, participants identify which faces they have seen when they are presented amongst novel faces. We expect to find that smiling faces will be remembered better and that participants in happy moods will display better memory overall. More importantly, we expect that inducing a positive mood will reduce the ORB. Further, we expect smiling faces to be associated with a reduced ORB. If we are correct, then members of minority groups could reduce the ORB in members of majority groups by simply smiling; thus, making it more likely that majority group members will remember them and display less bias.

Effects of Seed Density on Ecosystem Processes in California Annual Grasslands

Rebecca Devereux
Sponsor: Valerie Eviner, Ph.D.
Plant Sciences

Plant productivity and nutrient cycling are key processes that shape most other community and biogeochemical processes in a system. Previous studies indicate seed density, as opposed to fertilizer, as a factor of increasing aboveground productivity and overall plant nutrition. High initial seedling densities can minimize erosion and weed establishment, and are likely to minimize nutrient leaching because nutrients are sequestered in the dense seedlings. Range managers seek to understand the factors that limit or enhance productivity and nutrient cycling, particularly seed density, to maximize forage quantity and quality. In order to increase our understanding of soil variability and plant C and nutrient dynamics, this study plans to experimentally determine the effects of seed input on plant C and nutrient dynamics. Methods to evaluate our questions include locally collecting seed that was planted into lysimeters at four densities and monitored for one growing season, and using ion exchange resin bags and soil leachate that were collected throughout the growing season. At the end of the growing season, lysimeters were destructively harvested to obtain soil and biomass (above & below ground).

Gene Coding for Parasitic Weed Resistance

Calvin Diep
Sponsor: John I. Yoder, Ph.D.
Plant Sciences

The parasitic plant Striga can devastate agricultural communities across Africa, reducing the yield of Maize, Sorjhum, and other essential crops by more than half. Finding a gene that confers host resistance can help reduce the impact of these parasitic plants. Parasite plants form attachment structures called haustoria in response to host chemical signals and also form specialized vessels internal to the haustoria, allowing the parasite to extract water and nutrients. *Triphysaria versicolor* is a facultative hemi-parasite that is used as a model for Striga to study the interaction between parasitic and host plants. I am infecting wild type and mutant strains of *Medicago truncatula* with *T. versicolor* to determine the affects of mutations on infectivity. Host plants with mutations in specific genes required for the early steps of bacterial and fungal symbiosis, have been inoculated *in vitro* with *T. versicolor*. Microscopy and root sectioning is being used to determine whether a successful parasite invasion is established in each condition. By observing the interaction between *T. versicolor* and various mutants, I hope to identify a gene that codes for host resistance. Incorporation of this gene into crop plants may be a strategy for developing parasitic weed resistant crops.

Determining the Limit of Detection of a Multiplex LATE-PCR Assay for Pathogen Detection in Critically Ill Patients Using Genomic DNA

Anna Michelle Dillier
Sponsor: Gerald J. Kost, M.D., Ph.D.
Medical Pathology and Laboratory Medicine

The purpose of this study was to determine the limit of detection (LOD) of a multiplex linear-after-the-exponential polymerase chain reaction (LATE-PCR) assay using pure pathogen genomic DNA (gDNA) and whole organisms commonly found in critically ill patients with septicemia (e.g., *S. aureus*). Sepsis is the leading cause of death in non-coronary intensive care units. Rapid detection and identification of the pathogen(s) responsible for infection can enable appropriate antimicrobial treatment, ultimately improving patient outcomes. Nucleic acid recognition (NAR)-based methods, such as PCR, present an advantage over traditional blood culture by producing faster results and aiding in definitive pathogen identification. LATE-PCR is a novel asymmetric PCR method utilizing limiting and excess primers to produce single stranded DNA amplicons detected by organism-specific probes during temperature dependent endpoint analysis. DNA from whole organisms obtained from the American Type Culture Collection (ATCC) was extracted using a commercially developed sample preparation protocol (Smiths Detection Diagnostics). The eluate and the pure gDNA were then serially diluted to concentrations ranging from 10^{5} to 10^{-2} genome copies/μL and tested in multiplex on the LATE-PCR assay. The lowest DNA concentration producing a positive result from six reactions defines the limit of detection for each respective organism.

The Role of Experience in the Intersensory Perception of Pet Categories During Infancy

Rebecca L. Distefano
Sponsor: Lisa M. Oakes, Ph.D.
Psychology

Intersensory perception is the integration of information from multiple sensory modalities (i.e. sight and sound). Such integration is vital to the formation of categories. For example, people's category of *dog* includes information of the sights, sounds, and smells associated with dogs. This project examines the role of intersensory perception in the formation of pet categories in infants, while specifically investigating how experience with these animals may influence the results. I use a *habituation procedure* in which 10-month-old infants are presented with two different sound and image combinations of a cat meowing and a dog barking. During habituation, infants are shown these combinations repeatedly until they become disinterested. Once habituation occurs, the sound is switched (i.e. the dog meows). I compare the looking time during habituation to the looking time of the test trial. If the infants look significantly longer at the test trial, I can conclude that the infants recognize that the sound-image combination is novel. I hypothesize that infants with pet experience will have increased sensitivity to the fact that specific sounds (i.e. bark) belong to a specific animal (i.e. dog), which will be demonstrated by longer looking time during the test trial.

Catalytic Conversion of Furan

Jonathan N. Doan
Sponsor: Bruce C. Gates, Ph.D.
Chemical Engineering and Materials Science

The catalytic conversion of furan (a compound representative of lignocellulosic derived bio-oils) in the presence of H_2 was investigated with a flow reactor operated at 573 K and atmospheric pressure. The catalysts used were platinum supported on alumina, platinum supported on silica, alumina, and HY zeolite. Products of the reaction were characterized by gas chromatography-mass spectrometry. The most abundant products found were propane, propene, butanal, 3-heptene, and 2-heptene. Chemical standards were used to enable quantification of the identified products with a gas chromatograph equipped with a flame ionization detector. The data were used to calculate a response factor for each product and when data were lacking for specific compounds, values were estimated via effective carbon numbers. The kinetically significant reaction classes in the conversion of furan are being studied to help determine a detailed qualitative reaction network, including quantitative kinetics of the major reactions.

Invisible Women-Beer Brewers in Colonial Kenya

Amanda Domingues
Sponsor: Corrie Decker, Ph.D.
History

In pre-colonial Kenya beer was essential to indigenous social and ceremonial activities. The process of harvesting the grains and sugar, fermenting the alcohol and serving the beer was the responsibility of women. Women's control over beer remained constant until Kenya became a British colony in 1895. Between 1915 and 1923 the colonial government took swift efforts to control beer consumption and production. By the early 1930s the government turned its focus from preventing beer production to managing it through the creation "Native beer halls." During these years of colonial control, women seemed to disappear from the alcohol industry. This research examines the evolution of female participation within the urban sector of colonial Kenya. Beer brewing played an intrinsic role in African women gaining social and economic agency. I will address how colonial officials chose to overlook these actions because they did not view women as a threat to colonial order as they were able to control production in urban sectors. By using colonial government records including Annual Licensing Reports, Native Liquor Ordinances, and documents that mention beer brewing and or attempts to control women in urban areas, I will examine how and why women brewers were overlooked by colonial administrators.

The Things You Learn at Home: Support Persons' Work with Survivors of Sexual Abuse

Jasmine S. Dorrell
Sponsors: Kimberly Nettles-Barcelon, Ph.D., Luz Mena, Ph.D.
Women and Gender Studies

This project looks at the culture that is generated in families with survivors of sexual trauma. By looking at existing case studies, research on rape culture, media representations of victims and perpetrators, I am exploring the social and political regulations within the culture. Support persons can include police officers, counselors/therapists, activists, and advocates. Each person provides a window to explore the issues of environmental influence on each new generation. Does this trauma influence family structure? Do new generations express markers of sexual trauma without having directly experienced trauma? Are there any instances of this happening where the trauma is not an open part of the family dynamic? How do support person perceptions of survivors influence their interactions? In looking at the ways that families cope with and integrate the trauma of sexual violence I will be looking at how rape culture is reproduced and represented to each new generation. By examining support persons' influence I can see the internalization of rape trauma on outsider perception.

Identifying Genes Involved in Root Development Using Expression-based Methods

Michael W. Dorrity
Sponsor: Siobhan M. Brady, Ph.D.
Plant Biology

Identifying genes involved in root development using quantitative genomics is a process incorporating many different techniques: from observing and measuring phenotypes in order to quantify physical variation, to using computational methods to process large amounts of data to identify loci. My work has been centered on a particular region of the tomato genome which I have found, in gathering preliminary phenotypic data, to influence both root length as well as growth along the gravity vector. The next step in this experiment is to quantify expression of genes in this region using RNA sequencing and quantitative PCR to identify the RNA transcripts which may responsible for the phenotypes we observed, or which may be correlated with root development. With these data, I will present results that answer these questions: 1) Is there 5' degradation of transcripts using a high-throughput mRNA isolation protocol? 2) What are the changes in gene expression that underlie this altered root morphology? 3) Are there cellular changes in the root meristem that are associated with this phenotype and this genomic region?

Software for Exact Integration of Polynomials Over Polyhedra

Brandon E. Dutra
Sponsor: Jesus De Loera, Ph.D.
Mathematics

We explore the fast computation of exact integrals of polynomial functions over domains that are decomposable into convex polyhedra; furthermore, we present practical implementations and extensions of two different algorithms presented in previous work. The Triangulation algorithm is optimized for integrating a full-dimensional simplex and is applied to a general convex polytope by triangulating the given polytope into a finite collection of simplices and then integrating over each simplex individually. In the other algorithm due to Lawrence et al., it first triangulates a polytope's tangent cones-instead of triangulating the entire polytope as in the former algorithm-and then integrates over each simple cone individually. Our experiments reveal that these two algorithms are complementary: simple polytopes integrate faster using the Lawrence algorithm, while simplicial polytopes integrate faster using the Triangulation algorithm. In addition, we describe the software implementation tools while providing benchmark computations. In the special case of finding volumes of polyhedra, we also compare the benefits of exact rational computation to leading floating-point numerical methods and current software tools.

Effects of Water Conditions on Ultrasound Image Quality

Anahid Ebrahimi
Sponsor: David A. Hawkins, Ph.D.
Neurobiology, Physiology and Behavior

Ultrasonography is a safe and powerful technique that can be used to visually and quantitatively evaluate the internal structures and deformations of the human body *in vivo*. Water immersion is a technique used in muscle-tendon research that utilizes ultrasound. In this technique, a subject places a limb, such as the lower leg, in a water filled tank. Custom fixtures hold one or two ultrasound probes over the limb and just contacting the water. The water serves as the coupling medium between the transducer(s) and the subject. This approach provides researchers with a method for non-invasively obtaining consistent images of a subject's internal structures over time. Although most conditions can be controlled (i.e. transducer, immersion tank), the quality of the coupling medium may vary. This experiment tests whether or not the type of water used as the coupling medium affects the resolution of the ultrasound image. Calibration tests and image area analysis with three different water sources-deionized, degassed, and tap water- will be used to determine if water source significantly affects ultrasound image resolution. If it does, then results will be applied to identify the best water source to use in ultrasound studies that utilize the water immersion technique.

Cajal Retzius Neuron Density in Autism

Ehsan Ejaz
Sponsor: Veronica M. Cerdeno, Ph.D.
Medical Pathology

Autism is a spectrum of neuropsychological disorders characterized by abnormalities in reciprocal social interaction, communication, and repetitive interest and behavior. The etiology of Autism is still unknown. MRI studies have shown that the temporal lobes, a region known to control social, spatial and lingual functions, are affected in autistic individuals. Additionally, research has shown cortical Reelin (Reln) protein is reduced in layer I of autistic cerebral cortex. Reln is synthesized by Cajal Retzius (CR) cells located in cortical layer I. The decrease in the amount of Reln in layer I can be due to a decrease number of CR cells, or to a decrease in the production of Reln by CR cells. We hypothesized that the decrease on the amount of Reelin in the cortex is a consequence of a decrease in the number of CR cells in layer I. To test this hypothesis, we stereologically determined the density of CR cells in layer I of the superior temporal lobe of 6 autistic and 6 control human brains. We found that the density of CR cells in layer I or the superior temporal lobe is similar in autistic and control brains.

The Effect of CaMKII on Sodium Entry in Cardiac Myocytes

Jeffrey H. Elliott
Sponsor: Sanda Despa, Ph.D.
Pharmacology

Via the Na/Ca exchanger, intracellular sodium ($[Na^+]_i$) levels are crucial in regulating intracellular Ca in cardiac myocytes, and thus in maintaining regular contractions of the heart. Studies have found that $[Na^+]_i$ is elevated in heart failure due to enhanced Na entry via a TTX-sensitive pathway, suggesting a role for voltage-gated Na^+ channels. Ca/calmodulin-dependent kinase II (CaMKII) activity is also increased in HF and this may increase the slowly inactivating Na^+ current. The focus of this study is to determine the extent to which CaMKII alters Na entry in cardiac myocytes, possibly through slowly inactivating Na^+ current. We measured Na influx as the rate of $[Na^+]_i$ rise upon inhibition of the Na^+/K^+ pump with strophanthidin. This was done in control cells and in myocytes, in which CaMKII was over-expressed by adenoviral gene transfer. $[Na^+]_i$ was measured with the fluorescent indicator Na^+-sensitive dye benzofuran-isophthalate (SBFI). We also used ranolazine, which specifically blocks the slowly inactivating Na^+ channels, to determine the role of these channels in the CaMKII effect on Na^+ entry. Our results suggest that increased CaMKII activity elevates Na entry in cardiac myocytes and this might lead to higher $[Na^+]_i$ in heart failure.

Affordance Location in Preschool Children

Taylor M. Ely
Sponsor: Richard Coss, Ph.D.
Psychology

The current study observed the ability of preschool children to locate a safe affordance containing properties of both prospect and refuge. To simulate the historically significant context of seeking refuge, 3 to 5 year-old children were presented with a white-tailed deer or leopard model and asked to go to a place on a playground where they would "feel safe." A total of 41 children, 25 boys and 16 girls, were available for the study, which took place at the Center for Family and Child Studies in Davis California. The study examined the amount of time it took for the children to react to each model and the number of prompts from the experimenter that were needed before each child fled to a safe location. This study also addressed the question of whether age and sex contributed to any behavioral effects after viewing the two animal models. While no reliable sex differences were found, one behavioral measure, number of prompts encouraging the child to seek a safe location, yielded a statistically significant difference.

The Prevalence of Adolescent Pregnancy and Its Impact on Maternal Mortality and Health in the Coastal Region of Oaxaca

Skye Emerson
Sponsor: Adela De la Torre, Ph.D. Chicano Studies

Oaxaca has the highest rates of maternal mortality within Mexico, particularly within the Oaxaca coast. The following study attempts to understand the connection between high maternal mortality rates, and adolescent pregnancy that underlie the unique cultural and linguistically indigenous communities of the Oaxaca Coast. These findings resulted from clinical observation and studies of adolescent deliveries, interviews with respective health educators, and providers, and clinical literature that illustrate the barriers young women face in obtaining care and the risk factors attributed to adolescent pregnancy. Contributing factors to maternal mortality include, access to health care facilities, lack of contraceptives and sex education as well as the cultural repression of young women. Adolescents also have a higher risk of complications during delivery due to anemia and hypertension. The coast poses unique barriers to health care access and delivery of care, due to the fact that doctors and health educators must operate within the diverse cultural communities, isolated by rough terrain, that are often hard to penetrate. These studies will further the research onto the application of health care services to young women in indigenous communities that will reduce adolescent pregnancy and ultimately maternal mortality rates.

Support for Room Temperature Storage of Reconstituted High-density Lipoprotein: a Fourier Transform Infrared Analysis of Trehalose-based Stabilization

Lindsay R. Epperly
Sponsor: Atul N. Parikh, Ph.D. Applied Science

High-density lipoproteins (HDL) are nature's native nanostructures that function as a transport vehicle for removing cholesterol from the peripheral tissues in the human body. Nascent HDL exists *in vivo* as discoidal lipid bilayers, 5-8 nanometers in diameter, belted by a scaffolding apolipoprotein. These nanostructures can be reconstituted *in vitro* using chemical self-assembly methods and designed to incorporate amphipathic or hydrophobic drug candidates, thus providing a biocompatible carrier for delivery. An ability to preserve their structure in a dehydrated state would allow for long-term storage and transport. To this end, we are investigating the hydration-dependent stability of reconstituted HDL (rHDL) using the disaccharide trehalose. Trehalose is the most common stabilizing sugar amongst anhydrobiotic organisms naturally able to survive dehydration. Using Attenuated Total Reflection'Fourier Transform Infrared spectroscopy (ATR-FTIR), we investigated rHDL (1) in its original, aqueous state; (2) in a dehydrated state; and (3) in a rehydrated state. The amide I peak (1600-1700cm-1), due to the scaffolding apolipoprotein, was mathematically deconvolved and the percentage of secondary structures present in each hydration state determined. Our results show that optimum stabilization of secondary structures, particularly the aggregated strands, was achieved when 500mM trehalose was added to the rHDL sample prior to dehydration.

APOBEC3H Haplotype I Localizes in the Nucleus Independently of an Active Transport Sequence

Kristin Ethier
Sponsor: Bryce Falk, Ph.D.
Plant Pathology

APOBEC3 proteins belong to a family of cytidine deaminases that have antiviral activity against viruses. APOBEC3H is polymorphic in human populations and different haplotypes encode proteins with different levels of stability. Recently, it has been observed that the most stable APOBEC3H protein, encoded by haplotype II, localizes to the cytoplasm while the less stable protein, encoded by haplotype I, is found in both the cytoplasm and nucleus. APOBEC3H haplotype I was tested for dependence of an active nuclear localization signal. APOBEC3H haplotype I or haplotype II was cloned with pyruvate kinase to make a large fusion protein that needs a nuclear localization signal to enter the nucleus. The fusion proteins of APOBEC3H by both haplotypes I and II remain in the cytoplasm; therefore, the transport of the haplotype I protein into the nucleus is independent of an active nuclear localization signal. Future studies should examine the nuclear export abilities of APOBEC3H haplotypes I and II.

Electricity Generation from Tomato Pomace Inside Microbial Fuel Cells

Allison A. Evans
Sponsor: Farzaneh Rezaei, Ph.D.
Biological and Agricultural Engineering

Microbial Fuel Cells (MFCs) have been introduced as a novel technology to generate electricity simultaneously with wastewater treatment, direct biological conversion of electricity to methane, hydrogen generation, water desalination, and bioremediation. Power generation in MFCs, however, has been limited by dilute, soluble and easily degradable carbon sources with few studies on the feasibility of utilizing lignocellulosic biomass as the sole electron donor in MFCs. Food-processing residues provide an abundant source of biomass, while avoiding the controversial "food vs. fuel" debate for land use. Feasibility of using these solid wastes inside MFC has not been investigated previously. In this study, tomato pomace (TP) was used inside MFCs, and voltage generation and substrate consumption were monitored to elucidate the ability of the MFC to break down this material. It was demonstrated that TP can be successfully utilized with maximum power generation of 97 mW/m^3 and 85% pectin removal. Future experiments will seek to utilize various biomass substrates at higher solids loading rates to further examine the extent of substrate degradation in the MFC. The hope is to establish the MFC as a technology for simultaneous waste diversion, electricity production, and biomass pretreatment, toward the ultimate goal of tackling our growing energy problem.

Difference in Spatial Cognition in Children with Chromosome 22q11.2 Deletion Syndrome Compared to Typical Developing Group

Monika Farhangi Oskuei
Sponsor: Tony J. Simon, Ph.D.
Psychiatry

Chromosome 22q11.2 Deletion Syndrome (22q11.2DS) is a genetic disorder that involves a microdeletion on the q arm of chromosome 22 and is characterized by heart defects, cleft palate, facial dysmorphisms and cognitive delay. One area that we believe is affected in this population is spatial cognition. Spatial cognition is an important process by which a child makes sense of the surrounding world. This study was conducted to investigate spacial information processing and possibly interhemispheric neural connectivity in children with 22q11.2DS using complementary tasks: the two-hand line bisection and the landmark tasks. These tasks allow us to measure differences in spacial information representation and processing that might underlie visuospatial impairments in children with this disorder. Performance by children with 22q11.2DS was contrasted with performance in an age-matched group of typically developing children. The data from both tasks show that children with 22q11.2DS have less spatial resolution than their typically developing peers. In particular, they have more problems with decision-making on a fine scale.

Developing a FRET Sensor for Measuring CamKII Activation in the Heart

Amanda Ferguson
Sponsor: Julie Bossuyt, D.V.M.
Pharmacology

Ca2+/calmodulin-dependent protein kinase II (CaMKII) has been identified as a key nodal point in the development of cardiac hypertrophy and heart failure. Key findings here are that (1)CaMKII activity is increased in hypertrophied and failing myocardium, (2) CaMKII over expression causes myocardial hypertrophy and heart failure, and (3) CaMKII inhibition prevents myocardial hypertrophy and heart failure. Nonetheless key aspects of CaMKII signaling in the heart such as kinetics of activation and the roles played by different isoforms are still poorly understood. The predominant CaMKII isoforms in the heart are CaMKII δB and δC (which are respectively targeted to the nucleus and cytosol). So we decided to develop a FRET-based CaMKII activity reporter for each of these isoforms to dissect their activation and function in adult cardiomyocytes. Our FRET sensors consist of the full-length kinase flanked by the FRET pair fluorophore (using both the CFP/YFP and GFP/tagRFP FRET pairs). A similar approach was previously successfully used for the neuronal CaMKIIα isoform. This activity reporter should allow direct *in vivo* measurements of CaMKII activation and help understand the integrated local signaling aspects of this important kinase.

Gastrocnemius and Soleus Muscle Contributions to Ankle Plantar Flexion Torque

Rosa Marie M. Ferris
Sponsor: David A. Hawkins, Ph.D.
Neurobiology, Physiology and Behavior

The soleus (sol) and gastrocnemius (gast) muscles provide the primary forces responsible for ankle plantar flexion torque (APFT), but their relative APFT contributions have not been reported. The purpose of this study was to quantify the contribution that the sol and gast muscles can make to APFT as a function of ankle and knee angles. Collegiate level endurance athletes performed isometric maximum ankle plantar flexion efforts while positioned in a modified incline bench equipped with an ankle torque transduction system that allowed testing of various ankle/knee angle combinations. Sol and gast muscle contributions to APFT were calculated for each ankle/knee angle combination. The following results describes the data of 4 subjects; 20 subjects are expected to be tested. With the knee fully flexed, subjects generated their largest APFT with the ankle fully dorsiflexed. APFT decreased with plantar flexion to about 15% of maximum APFT at a 120° ankle angle. As a function of knee angle, APFT was greatest at 90°. The average sol APFT is largest when the ankle is dorsiflexed and decreases to less than 8 Nm in extreme plantar flexion. With the ankle dorsiflexed, the gast can generate its greatest APFT with the knee at 90 degrees.

An Experimental Study in Acorn Starch Grain Preservation and Identification

Ursula Filice
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

As people eat, starch grains often lodge in dental plaque. Plaque can become fossilized as dental calculus, preserved for tens of millennia. Their extraction and identification by archaeologists can tell us about ancient diets. Acorn was a staple food for California Indians, and we expect to find acorn starch grains in calculus. Yet, a prior study of human dental calculus from 16 individuals in the California Delta failed to identify acorn starch although starch grains from other species were. The purpose of the present study is: 1) to investigate whether the methods of preparing acorns for consumption, like grinding, leaching, and boiling, damages or destroys acorn starch grains; 2) to create a database of the damage caused by different processing methods, to be used in future studies involving starch grains and dental calculus of Native California People and beyond. For this study we processed Interior Live Oak (*Quercus wislizenii*) acorns, using methods closely resembling those of Native California People, such as hand grinding, different types of leaching and cooking methods, removing samples at 5 minute intervals. Under magnification we analyzed the extent of the resulting damage to acorn starch grains, and where possible, determined the density of grains present.

Effect of Enzymes Added to Chloroform-Methanol Method for Total Lipid Extraction of Ground Tomato Seeds

Marion E. Fischer
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Animal Science

Tomato seeds can be used as a source of protein and lipid in rations for dairy cattle in areas where tomato processing occurs. Previous measurements of the total lipid content of tomato seed meal using ether extract (EE) were lower than the values obtained by gas chromatography (GC), demonstrating that EE does not successfully extract all lipid in the meal. An alternate lipid extraction protocol uses chloroform and methanol. This method will be investigated as a tool for measuring the lipid content of ground tomato seeds that is more accurate than EE and less intricate than GC. The enzymes α-amylase, pancreatin, and pepsin will be added to the method individually and as a mixture. It is hypothesized that the lipid droplets in tomato seeds are surrounded by a protein or carbohydrate coat, and the enzyme step will help break down the coat to increase total lipid extraction. The enzyme method that extracts the largest proportion of total lipid will demonstrate whether the lipid droplets are surrounded by protein or carbohydrate. The lipid content of canola seed meal will be determined with EE, GC, and the enzyme method to study the accuracy of the method with other oilseeds.

Search for Alternative Repellents: A Behavioral Study

Eric A. Flounders
Sponsor: Walter S. Leal, Ph.D.
Entomology

Mosquitoes are attracted to their hosts mainly by olfaction and transmit various diseases while blood feeding. At the moment the best method of avoiding the bites and thereby transmission is by using insect repellents. DEET (N, N-diethyl-3-methylbenzamide), which has been used for over 50 years, is the most affective compound known to repel a variety of insects like mosquitoes, ticks and drosophila. Due to the availability of diverse genetic tools we choose drosophila to identify molecular targets of repulsion. Two new compounds (IR3535 and Picaridin) have been recently approved to be used as affective mosquito repellents. However their effectiveness against drosophila remained un-established. Using an olfactory-based choice assay I was able to show that the fruit fly is equally repelled by all the three compounds. We further established that a specific olfactory receptor neuron in the fly (ORN) was stimulated by the three compounds in a dose dependent manner. We have identified DmOr42a as the molecular receptor conferring the response. This receptor has the potential to be used as a high throughput-screening tool to develop safe and effective repellents.

Infant Outcomes in Relation to Milk Energy and Cortisol Across Lactation in Rhesus Macaques

Alison B. Foster
Sponsor: Karen Bales, Ph.D.
Psychology

The role of mother's milk on infant physical and cognitive development has long been a rich area of nutritional research, but the consequences for infant behavior have remained largely unexplored. Moreover whether non-nutritive components in milk, such as hormones, influence infant outcomes, is poorly understood. Recently it has been shown in rhesus macaques (*Macaca mulatta*) that behavioral dispositions of infants at 3-4 months of age were correlated with available milk energy produced by their mothers during early lactation (Hinde and Capitanio 2010) and milk cortisol concentrations at peak lactation (Sullivan et al. 2011). However, the relationships among infant outcomes, available milk energy, and milk cortisol across lactation have not been systematically investigated. In order to do so, milk samples were collected at early and peak lactation from N=77 rhesus macaque mothers at the California National Primate Research Center during 2010 to determine milk cortisol concentrations and available milk energy. Technicians conducted behavioral observations and temperament ratings on all infants. Due to our close evolutionary relationship, this non-human primate model provides important insights into underlying physiological mechanisms and informs our understanding of these processes in human developmental trajectories. This research was supported in part by NSF BCS-0921978 NIH #RR019970, RR000169.

The Effects of Flooring in Calf Hutches on Airborne Bacteria and Ammonia Concentrations

Ashley L. Fowler
Sponsor: Frank Mitloehner, Ph.D.
Animal Science

The objective of this study was to determine the effects of floor management in calf hutches on ammonia and airborne bacteria concentrations. Sixty-three Holstein bull calves were housed in wooden hutches and randomly assigned to one of three flooring treatments: wooden slatted floors and no bedding (CON); no wooden slatted floor, but bedding provided (BED); no wooden slatted floor, but with an acidifier (Sodium Bisulfate) applied to the bedding (SBED). Ammonia and airborne bacteria concentrations were measured weekly for three weeks using an Innova 1412 multigas analyzer and Anderson biological cascade impactors, respectively. Average ammonia concentrations differed ($P < 0.001$) across treatments, with SBED having the lowest and CON having the highest ammonia concentrations. Airborne bacteria concentrations were lower ($P < 0.001$) for CON versus other treatments. Overall, SBED flooring reduced ammonia concentrations the greatest, while CON flooring reduced airborne bacteria concentrations the greatest. These results highlight the complexities of floor management and will eventually assist in optimizing housing of newborn calves.

Effect of Plasticizers in Biopolymer Films on Growth of Food Pathogens in a Food Matrix

John C. Frelka
Sponsor: Nitin Nitin, Ph.D.
Food Science and Technology

There has been increasing concern about pathogens in food in recent years. The Center for Disease Control estimates that 76 million cases of food borne illness occur each year. The majority of laboratory-confirmed cases are caused by microbial food pathogens such as *Samonella and E. coli* (STEC) O157. Some recent research has been focused on biopolymer films as an alternative food packaging. Though these films have been extensively tested for mechanical and barrier properties, little is known about their effect on microbial growth. This study concentrates on the effect of Whey Protein Films with various plasticizers as a model to study food pathogen growth, focusing on *E. coli* O157:H7, *Salmonella enterica*, and *Listeria monocytogenes*. Films were made using glycerol, polyethylene glycol 200 (PEG), sorbitol, and beeswax as plasticizers. The growth of pathogens was monitored in lettuce leaves and meat. The films were added to leaves and meat and assayed at 0, 24, and 48 hours incubation time. At each time point, the sample was washed to extract the bacteria and then counted using a colony forming unit (CFU) assay. The results of this study will help researchers understand the effects of plasticizers in biopolymer films on the growth of microbes.

Ancient Use of Shellfish Resources in Fairfield, California

AnnaMarie K. Fritschi
Sponsor: Jelmer W. Eerkens, Ph.D.
Anthropology

The archaeological site, CA-SOL-364, in Fairfield, California, was occupied by Native peoples between 1300 and 2000 years ago. The site is currently located 14 km from Suisun Bay and 22 km from San Francisco Bay, yet contains an abundance of shellfish remains, indicating that people regularly consumed these products at the site. Mussels are the dominant species present, but others, such as clams and abalone, as well as crustaceans, such as crabs, are also present in the assemblage. We aim to determine the energetic returns on shellfish gathering and transport over such distances, to help determine whether the shellfish were gathered for basic sustenance or were "novelty" items consumed in feasts or other special events. We use foraging models from the field of human behavioral ecology to derive estimates of caloric return rates on shellfish harvesting and transport. By weighing and identifying the various species of shellfish, and converting shell weights into estimates of original meat weights, we intend to draw conclusions about diet and the role of Bay resources at this ancient habitation site.

Examining the Role of Polymerase 4 in Microhomology-Mediated End Joining

Becky Xu Hua Fu
Sponsor: Wolf Heyer, Ph.D.
Microbiology

DNA double-strand breaks (DSBs), caused either by exogenous or endogenous factors, will lead to cell death unless repaired by DNA repair pathways that maintain genome stability. DNA polymerase 4 (Pol4) has been implicated in a pathway of DSB repair called microhomology-mediated end-joining (MMEJ) which uses short segments of microhomologies (5-25 bp) to repair DSBs. To determine Pol4's role in DNA repair, *pol4* mutants (catalytic point mutants and deletion mutants) were tested in novel MMEJ interchromosomal (inter) and intrachromosomal (intra) recombination assays containing 16, 20, and 25 bp of microhomologies using the model organism, *Saccharomyces cerevisiae*. The *pol4* catalytic mutant showed a statistically significant decrease in recombination of 2 and 2.5 fold for 16 bp and a 4.5 and 5 fold for 20 bp in the inter and intra MMEJ assays respectively. The *pol4* deletion mutant also showed a decrease in recombination of 37 and 4 fold for 16 bp and 2 and 9 fold for 20 bp inter and intra MMEJ assays respectively. The analysis of Pol4 reveals that it does have a role in MMEJ and its optimal homology length is around 20 bp. In addition, these results show there is no other polymerase that fully complements Pol4's function.

The Allure of Sagrada Familia

Zoe M. Fujii
Sponsor: Susan Avila, M.F.A.
Design

Tourists from all over flock to see Antoni Gaudi's grand and unusual Sagrada Familia. Gaudi's playful, naturalistic style of architecture is confusingly odd, and yet intrigues many people for its uniqueness. I approach my fashion identity in the same way, and those who know me recognize my distinctive individualistic style. By incorporating elements of Gaudi's controversial style into my own, I am creating an avante garde fashion collection of six garments that confronts conventional fashion design practices and celebrates uniqueness. In order to evoke the same feeling in fabric that Gaudi has with his architecture, my collection incorporates screen-printing, free form machine stitched lace, laser cutting, and synthetic fabric heat manipulation. Through my collection, I am creating a platform to highlight Sagrada Familia on the human form and bring Gaudi's naturalistic style to a new audience, creating an exciting new way of looking at architecture that will inspire future designers.

The Federal Reserve Board: Organizational and Research Intelligence Gathering During a Recessionary Episode

Akshaya Ganesh
Sponsor: Larry Berman, Ph.D.
Political Science

Due to the Great Recession a majority of the American public has encountered numerous difficulties in their lifestyles, yet it is primarily low and moderate income communities and small businesses that have suffered the most due to insufficient services and a decline in the amount of provided credit. The Federal Reserve Board is trying to obtain information about these low and moderate-income families and small businesses to implement effective methods to rectify their situations. The Community Data Initiative Project is a poll that will be administered to leaders in the Reserve Banks to discover which issues impoverished communities are experiencing. The Small Business Project has been introduced to determine the reasons for the decrease in credit allocated to small businesses. Consumers and small businesses are two important sources that help stimulate the economy and it is for this reason that they deserve the attention of the Federal Reserve System and the federal government so they can once again boost the sluggish economy.

Dynamic Model of Human Digestion

Yiyang Gao
Sponsor: Paul Singh, Ph.D.
Food Science and Technology

A need for a mechanical model that replicates peristalsis (the muscle contractions used by the stomach during digestion) exists in a variety of fields. Several recent designs have been created; however, none accurately model the fluid dynamics within the stomach. Our plan builds off of a previous attempt by UC Davis to create a model that accurately depicts peristalsis. In order to improve on the previous prototype, the new design exhibits a tilt to better mimic the actual shape of the stomach and half rings (2" radius), that will encompass the stomach bag (4" diameter, 11" length). The rings encircle the stomach and move closer together as they are driven down the bag by tracks, slowly constricting the the model and mimicking the muscle contractions. A firm plastic backbone glued outside the stomach will make up for the force lost in the triangular area created where the rings meet.The model will measure digestion rates and fluid dynamics within the stomach during digestion. Information derived from this model will be compared with data collected from previous research using a pig's stomach. Once built, it will provide insight on how the stomach digests processed foods and dissolves pharmaceuticals.

Development of Transgenic *Xenopus laevis* as an *In vivo* Screening System for Endocrine Disrupting Chemicals

Elaine G. Garcia
Sponsor: John D. Furlow, Ph.D.
Neurobiology, Physiology and Behavior

Thyroid hormone (TH), specifically the active form triiodothyronine (T_3), is crucial to the morphological and physiological development of vertebrates. During amphibian metamorphosis, TH secretion by the developing thyroid gland induces a range of functional and morphological changes. An emerging concern in environmental toxicology is the potential for manmade chemicals to disrupt the tightly regulated TH endocrine system. Therefore, we have been developing transgenic lines of *Xenopus laevis* for use as rapid and sensitive luciferase based reporters of altered TR activity *in vivo*. My project focused on determining which transgenic reporter line most sensitively and reliably mimics endogenous TH regulated gene induction. In my experiment, I used THbZIP promoter-Luc, ΔMMTV TRE-Luc, and SV40 TRE-Luc constructs. The lines that closely parallel endogenous TH target gene responsiveness will be used to screen environmental compounds to determine their effects on TR regulated gene induction in this new *in vivo* reporter system. Prescreening tadpoles will reduce transgenic variability from any copy number differences. Future experiments will examine T_3 inducibility of reporter gene activity in multiple tissues in older tadpoles undergoing induced and spontaneous metamorphosis and T_3 dose response curves in multiple tissues to obtain EC_{50} values.

Contingencies of Self-worth as a Determinant of Job Resilience

Rocio Garcia
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Psychology

Many differences exist between individuals in high and low status jobs. In the current study, it was hypothesized that among individuals in lower status jobs, those who base their self-worth on other's opinions will report less job-related resilience and lower psychological well-being compared to those who base their self-worth on job performance. Based on a review of literature, the "Job Satisfaction Resilience Survey" (JSRS) was developed. The JSRS will be administered to a sample of employees who work in occupations that vary in status. A significant interaction between job status and contingencies of self-worth is anticipated, such that workers in lower status jobs that base their self-worth on other's opinions are expected to report significantly lower levels of job resilience and psychological well-being compared to lower status workers that base their self-worth on job performance. Differences in job resilience and well-being are not expected to emerge among individuals in high status jobs as a function of their bases of self-worth. This study's findings can help determine various resilience factors that can help aid individuals to both be resilient in their jobs and in their own life circumstances.

A First Step in Adapting Controlled Odor Mimic Permeation System (COMPS) to Study Olfactory Detection in Cockatiels

Victor M. Garcia
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Neurobiology, Physiology and Behavior

The controlled odor mimic permeation system (COMPS) was recently developed in canine applications to deliver odors at predictable concentrations over time. I am adapting this technique for use in determining olfactory thresholds in cockatiels (*Nymphicus hollandicus*). COMPS devices are heat sealed polymer bags loaded with a volatile compound. I tested 3 different starting volumes (100, 250 and 500 microliters) of 2-ethyl-1-hexanol, a volatile found in plastic explosives. Volumes were converted to weights so that dissipation rates could be measured as a change in weight over time. Three replicate COMPS were run for each starting weight at room temperature (17 degrees C), and each COMPS was weighed every two days for 30 days. Average dissipation rates were similar, and ranged from 0.0433 to 0.0463 grams per day. Volumes were fully dissipated at 6 days (100), 12 days (250) and 24 days (500 microliter). Results suggest that odor presentations should be restricted to the first 6 days after COMPS fabrication when comparing concentration detection abilities conducted under similar environmental conditions to my study. If these restrictions are followed, my results show that COMPS dissipation will be consistent across a range of concentrations needed to determine olfactory thresholds in cockatiels.

The Transition From Multicoloniality to Unicoloniality in Argentine Ants: A Simulation Model

Ivy H. Gardner
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Evolution and Ecology

Argentine ants, an invasive species worldwide, have dominated the California landscape since their introduction a century ago. Argentine ants in their native range cooperate only within their own nest and a few neighboring nests, however, invasive Argentine ants cooperate over a vast number of nests and thus form expansive supercolonies. We create a simulation model to analyze how Argentine ants transitioned from multicoloniality to unicoloniality during their invasion. Our model includes terms that describe the recognition of colonymates, worker interactions, male migration, and queen's reproduction of workers, males, and new queens, and spatial expansion of colonies by budding off new colonies. We find that a reduction in allele number generally leads to a reduction in colony number, but a substantial decrease in allelic diversity of about 60% is needed to transition from multicoloniality to unicoloniality. A large increase in carrying capacity caused by a more favorable environment also could cause a shift in colony structure. While either an extreme change in allele number or an extreme change in carrying capacity can cause the transition, a mixture of more modest changes for each is more likely to result in unicoloniality.

Cortisol and Temperament Moderate Children's Play Behavior in Response to Unfamiliar Social Situations

Aria Ghanaat
Sponsor: Paul Hastings, Ph.D.
Psychology

Changes in cortisol in response to novel social situations might affect HPA-mediated coping efforts. Higher parenting quality, encompassing supportiveness and sensitivity, has been linked to lower baseline cortisol, better emotion regulation, and social competence. It is plausible that parenting quality would be associated with greater cortisol increases when extroverted children enter novel social groups, whereas shy or inhibited temperament would predict smaller cortisol increases. We examined associations between parenting quality, child temperament, and young children's cortisol and play behaviors. Data were collected for 80 children (47 girls) between the ages of 2.75 and 5.42 years, and their mothers. More supportive mothers had children with lower cortisol levels when they arrived at the lab (b=-.29), for all children except highly exuberant boys (b=.52). More temperamentally exuberant children were more socially engaged and positive during play (b=.29), and more socially engaged, positive children tended to have smaller increases in cortisol (b=-.19). These findings suggest supportive parenting, temperament, and social play interact with each other but only cortisol and temperament are directly linked to play behavior. Another finding is exuberant boys with supportive parenting had the highest baseline cortisol levels, possibly because parents tend to foster active and outgoing behaviors in boys.

Utilizing Synthetic Biology to Engineer a Biological Copper Sensor

Pantea Gheibi
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

Copper is an essential mineral used for numerous biological cellular activities. However, excess amounts of copper can be harmful or even lethal; therefore the cell must maintain a fixed amount of copper intracellularly. In areas around the world where drinking water is scarce or polluted, a cheaper, more efficient method of water detoxification would help numerous people. In this work we propose a novel solution developed by synthetic biology that addresses part of this problem by inexpensively detecting copper in water. The expression of a targeted reporter gene, green fluorescent protein (GFP), will be regulated by a promoter, which is controlled by two repressors and serves as a visible signal of toxic copper in this biological sensor. These two copper-sensitive repressors, BxmR and CopY, normally bind the promoter region and unbind in the presence of copper. In our construct we will place the GFP reporter downstream of the synthetic tandem-promoter. Derepression by copper will cause the construct to fluoresce in the presence of copper. Once built, we will measure the sensitivity of this device in comparison to different copper concentrations in order to design a detector that is sensitive only in copper levels that are considered toxic for living cells.

Global Change Effects on Alpine Nitrogen Cycling and Microbial Communities

David J. Gonzalez
Sponsor: Benjamin Z. Houlton, Ph.D.
Soils & Biogeochemistry

Anthropogenic pollution is predicted to cause significant environmental change throughout the world's ecosystems. Alpine ecosystems, which historically have been isolated from direct human impact, are particularly susceptible to atmospheric changes. Increasing emissions of greenhouse gases and nitrogenous compounds into the atmosphere may have serious consequences for alpine communities. Here I examine the effects of a factorial combination of elevated temperature, elevated precipitation, and elevated soil nitrogen on a moist meadow alpine tundra ecosystem. Microbial biomass nitrogen and rates of nitrogen accumulation were measured to determine the microbial response to global change factors. Under conditions of elevated temperature, microbial biomass decreased, possibly due to drying of the soil. However, the combination of elevated temperature with elevated N or snow-pack yielded no significant changes in microbial biomass. Nitrogen accumulation rates increased under conditions of elevated nitrogen, but not under any other treatments. Shifts in plant community composition were observed, with some graminoid species increasing in relative abundance under elevated N but decreasing with elevated temperature. Above-ground plant productivity increased in response to elevated N, but decreased in response to elevated snow-pack. No interactive effects of the combination of global change factors were observed, suggesting that these factors may offset one another.

Effects of an ACL Injury Risk Reduction Training Intervention on Ground Reaction Force and Knee Flexion During Landing in Female High School Athletes

Amelia M. Goodfellow
Sponsor: Gretchen Casazza, Ph.D. Exercise Science

Injury to the anterior cruciate ligament (ACL) can end an athlete's career. Factors that increase an athlete's risk of ACL injury include gender, age, anatomical factors, strength of supporting muscles and characteristics of biomechanical movement. Further, ACL injuries frequently result from sudden stops or changes in direction and poor landings after jumps. While interventions cannot be made on most of the factors contributing to ACL strain and injury, an athletes' biomechanics can be changed to reduce ACL loading. By emphasizing increased flexion at the knee and "soft" landings, conditioning programs may be able to reduce ACL loading and thus risk of injury. Female athletes are disproportionately affected by ACL injuries, and younger athletes tend to lack the training to avoid ACL injury. This study implements a 3-month conditioning protocol designed to improve balance, coordination, agility, lower body strength and flexibility in female high school athletes ages 14-18. The 30 minute protocol will be implemented and supervised by study personnel during every practice. Force of landing from an 18" jump, knee flexion angle and degree of valgus/varus collapse will be measured every 4 weeks using a force plate and video data to track progress in developing ACL risk reduction biomechanics.

Maintained Baroreflex Sensitivity During Entry into Hibernation in the Syrian Hamster

Julia V. Gorgone
Sponsor: Chao-Yin Chen, Ph.D.
Pharmacology

During entry into hibernation, animals dramatically decrease homeostatic set-points for metabolism, core temperature, respiration rate, heart rate (HR) and blood pressure (BP) to conserve energy. The mechanisms utilized in the cardiovascular resetting process are unknown. I tested the hypothesis that during entry into hibernation, BP is actively regulated, not passively falling. Telemetry transmitters were implanted in the descending aorta of 4 Syrian Hamsters. After at least 12 days recovery in a 14:10 Light:Dark cycle at 23°C, hamsters were moved to an 8:16 Light:Dark cycle at 6±1°C. Continuous HR and BP were recorded for multiple bouts of hibernation. To determine baroreflex function, I calculated spontaneous baroreflex sensitivity (BRS) by identifying sequences of changing heart rate following inverse changes in blood pressure. During the initial phase of entry into hibernation (~2hrs), HR and BP decreased significantly (61±19 bpm, 54±14 mmHg respectively) while BRS was maintained (-11±2 bpm/mmHg). During the next 3-4 hrs of entry, BP and HR continued to decrease, with BRS falling as well (-3±1 bpm/mmHg). Data indicate maintained BRS sensitivity which supports my hypothesis that the blood pressure drop is actively regulated. (Supported by a President's Undergraduate Fellowship to JVG.)

Electron Microprobe Analysis of Pottery Sherds from Nazca, Peru

Alicia J. Gorman
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

Nasca culture thrived in the dry deserts of south-central Peru between AD 1 and AD 750. They are known today for the Nasca lines as well as their impressive polychrome pottery. Although the iconography on the pots has been well studied, little is known about the technological processes behind polychrome production. Our study aims to fill this gap through looking at the mineralogy and the recipes of the pigments used to create the vibrant colors seen on pots. Our sample is divided into an Early Nasca (AD 0-450), Loro (AD 750-100; a "local" Middle Horizon style), and Wari (AD 750-1000; a highland Middle Horizon style). Using electron microprobe analysis (EMP), we are able to examine the physical and chemical structure of pigments, as well as reconstruct the order in which they were applied to pots. Using wavelength dispersive spectrometry (WDS) and energy dispersive spectrometry (EDS), we are able to determine the chemical composition and mineralogy of pigments. Using Image-J, we are also able to calculate the average density, size, and roundedness of mineral particles within pigments. We are particularly interested in changes in the technological process of pigment use over time.

The Effects of Human Insulin on Mosquito Innate Immunity

Gabe Green
Sponsor: Shirley Luckhart, Ph.D.
Medical Microbiology & Immunology

Malaria is a devastating disease that kills more than one million people annually, and approximately half of the world is at risk of transmission. The disease is caused by eukaryotic *Plasmodium* parasites and transmitted by anopheline mosquitoes. After ingesting human blood containing malaria parasites or other foreign antigens, the mosquito mounts an innate immune response. One aspect of this immune response includes the production of the antimicrobial peptides, defensin and cecropin. It has been shown that insulin decreases the immune response in mammals; from this we hypothesize that human insulin could also decrease the mosquito immune response through this highly conserved signaling pathway. We treated mosquito cells with insulin and lipopolysaccharides (LPS) and found significantly decreased defensin and cecropin promoter expression when compared to cells treated with LPS alone. We are currently investigating the effect of parasite antigen on antimicrobial peptide expression in mosquito cells. By understanding the effects of human insulin on the mosquito immune response, we are able to target specific genes in this signaling pathway and apply this knowledge to develop transgenic mosquitoes that are resistant to malaria infection.

Evaluating the Environmental Impact of Four Fibers for Use in Textile and Fashion Design

Ellen A. Griesemer
Sponsor: Ann E. Savageau, M.F.A.
Design

This research is an attempt to gain better understanding of the environmental impacts of four fibers: cotton, silk, hemp, and wool, and how they can be used effectively and more sustainably within textile and fashion design. In doing this, I utilize several approaches to evaluating sustainability. The general conclusion of this research is that the Life Cycle Analysis method is an effective tool for measuring environmental impact of the complex relationships between the natural resources expended and the processes and energy used in material extraction/growth, manufacture, use, and disposal of these textiles. This method, which applies solely to evaluating these environmental factors, reveals the importance of including other aspects of sustainability, such as social issues, in my research. I use the information this analytical approach yields in the creation of garments, each demonstrating alternative design solutions to modern conventional materials. This small fashion collection will be presented at the two runway shows produced by the Runway Designer's Club.

The Role of RAD54 in Homologous Recombination: Exploring Alternative PIP Boxes

Sara M. Grossi
Sponsor: Jessica Sneeden, Ph.D.
Microbiology

Rad54 is a key protein involved in the genome maintenance pathway of homologous recombination. While this protein has been implicated in several steps of homologous recombination, its exact role at each step is not fully understood. For example, while it is known that Rad54 associates with the Rad51-ssDNA filaments, stabilizing them and delivering Rad54 to the pairing site in addition to stimulating Rad51-mediated DNA pairing and strand exchange in an ATP-dependent fashion, the exact mechanism is not fully understood. This project will explore alternative PCNA-interacting motifs of the Rad54 protein to better understand if and how PCNA interacts with Rad54 during the repair of double-strand DNA breaks. Mutants were created with mutations in PIP regions of the RAD54 gene and will be checked for retained wild-type ATPase activity and checked for differential activity in DNA-synthesis using D-loop assays as compared to wild type. Since mutations in two RAD54-homologous genes in human cells have been found in tumors, a better understanding of the mechanism involved in the DNA-repair pathway has clear implications for cancer research.

Making Money: Challenges and Benefits of Community Currency Systems

Arielle C. Guest
Sponsor: Frank W. Hirtz, Ph.D.
Human and Community Development

During the Great Depression many American communities formed their own local currencies as a way to avoid the declining value of national currency. Recently, a number of communities, in response to various social pressures, have again shifted toward more localized forms of currencies. Some were formed as an attempt to support local instead of global businesses. Still others are formed to create more community cohesion and build neighborhood empowerment. I primarily focus on two California communities that are developing local currency. Oakland and Davis have a unique set of social demands that are a challenge to local organizers. My research will analyze how each organization adapts to and provides for the complex needs of their communities. I hope to learn what drives these organizations to create a community currency, which trends in local currency has the widest applicability, what are different indicators of success, and if communities have had success in fulfilling their goals. My research includes interviews with community members, and local currency activists and critics. I will review academic texts and prior research conducted in this topic to analyzing community demographics. I am hoping through this research to understand ways in which local currencies succeed and fail.

s-EH Inhibitors Improve Cardiomyocyte Function in a Type-2 Diabetes Rat Model

Katie Guglielmino
Sponsor: Florin Despa, Ph.D.
Pharmacology

Of the risk factors leading to heart failure (HF), type-2 diabetes mellitus (DM2) is the most prevalent. Thus, there is a need for improved diabetic HF drugs. Epoxide hydrolase enzyme (s-EH) inhibitors are known to reduce blood pressure and inflammation in DM2 and increase the insulin responsiveness in pre-diabetes. In the present project, we assessed the efficacy of AR9281 s-EH inhibitor to improve cardiomyocyte function in a DM2 rat model. Rats in the treated group (N=10) received 1ml drug per liter of drinking water for 6 weeks, starting from the insulin resistance/pre-diabetes stage (blood glucose >150 mg/dl). Rats in the control group received same amount of polyethylene glycol, a neutral, biocompatible polymer. Blood glucose was measured weekly in all rats. At the end of treatment period, we measured Ca transients in isolated cardiomyocytes using fluorescent Ca indicators and fluorescence microscopy. We found that treatment attenuated the enhanced glucose excursion and improved cardiac Ca transients by 40%. The sarcoplasmic reticulum Ca content was decreased in both treated and untreated rats vs. control, but the treatment attenuated this reduction by 30%. These results suggest that preventive heart dysfunction treatment in insulin resistance may reduce the risk for diabetic HF.

Revolutionary Synthesis: An Exploration of Society Under Oppression

Mary J. Guillen
Sponsor: Susan Avila, M.F.A.
Design

My research project explores the twentieth century revolutions of Nicaragua and China through a unique clothing line. The fashion collection is representative of the political history of these countries and my cultural background. I conducted primary and secondary research to create original iconic motifs, image layering, and textile prints that convey the oppression Nicaraguan people faced during the revolution. Images from Nicaraguan periodicals depicting protests and casualties combined with original motifs can be seen on the clothing. The construction of the garments is based on both traditional silhouettes that were forbidden to be worn during the Chinese Cultural Revolution and the clothes people were forced to wear. Through these methods, my collection exceeds the usual function of clothing; the clothes educate the public about history and make a political statement about oppression and protest. In creating this collection I have gained knowledge of my cultural heritage and my family's role in both revolutions, which is invaluable to my personal identity.

Tic40 Interacts with Heat Shock Proteins to Mediate Protein Transport Across the Chloroplast Inner Membrane

Hoang T. Ha
Sponsor: Steven Theg, Ph.D.
Plant Biology

Heat shock proteins (Hsp) are ubiquitous proteins found in all cells and within many different cellular compartments. These proteins mainly act in the related functions of protein aggregation, transport, and folding, which is incredibly important in mitochondria and chloroplasts. Most mitochondrial and chloroplast proteins are synthesized in the cytosol (~90%) and then transported into the organelle, and as such, the mechanism behind the protein transport is very important. It is believed that Hsp70s possessing ATPase activity provide driving force transport proteins into organelles. For mitochondria, a matrix Hsp70 regulates this process, however researchers investigating Hsps in chloroplast, have shown that there are two motors translocating of protein precursors. These two heat shock proteins (Hsp70 & Hsp93) were shown to assist in protein transport into the chloroplast. However, the mechanism behind their assistance is currently unknown. Our research will test how these two proteins interact with one of the translocation complex proteins, Tic40, to transport proteins across the chloroplast inner-membrane. Learning more about the interaction between these two proteins can be used to ascertain genetic defects in chloroplasts of all plants.

Trinucleotide Repeat Expansion in the 5′-UTR of the FMR1 Gene Leads to Abnormal Neuronal Precursor Cell Differentiation

Joseph A. Hamera
Sponsor: Stephen C. Noctor, Ph.D.
Psychiatry

Fragile X-associated tremor/ataxia syndrome (FXTAS) is a late adult-onset X-linked neurodegenerative disorder caused by a trinucleotide repeat expansion in the 5'-untranslated region of the *FMR1* gene. Estimates of the incidence of the *FMR1* premutation in the human population indicate prevalence as high as 1:250 males and 1:130 females. FXTAS generally affects males over the age of 50 and presents as progressive motor and memory system dysfunction. However, recent work has found that the *FMR1* mutation is correlated with increased incidence of autism spectrum disorders, attention deficit hyperactivity disorder, and other cognitive and behavioral abnormalities in childhood. We examined prenatal brain development in a mouse model of the *FMR1* premutation and found significant abnormalities in time course and distribution of neuronal precursor cell populations in the embryonic neocortex, implying that pathological presentations of *FMR1* premutation occur from early stages of development. Specifically, we find that *FMR1* premutation mice have more cells that express the primary neuronal precursor marker Pax6 and fewer cells that express the secondary neuronal precursor marker Tbr2. These findings suggest that differentiation of neural precursor cells is delayed in the prenatal neocortex.

Sleep Apnea in Fragile X Premutation Carriers With and Without Fragile X-associated Tremor/Ataxia Syndrome (FXTAS)

Alyssa A. Hamlin
Sponsor: Randi J. Hagerman, M.D.
Mind Institute

Fragile X-associated tremor/ataxia syndrome (FXTAS) is a genetically based late onset neurodegenerative disorder seen in a subgroup of older adult carriers of the premutation (55-200 CGG repeats) of the fragile X mental retardation 1 (*FMR1*) gene. This study seeks to determine the prevalence of sleep apnea in patients with the *FMR1* premutation with and without FXTAS. Medical data from 430 participants -premutation carriers with and without FXTAS and controls - was used in this analysis. Adjusted logistic regression models were employed in the statistical analysis. The observed proportion of sleep apnea in premutation carriers with and without FXTAS and controls are 31.4%, 8.6%, and 13.8%, respectively. The adjusted odds of sleep apnea for premutation carriers with FXTAS is about 3.4 times that of controls and about 2.9 times that of premutation carriers without FXTAS. Sleep apnea is not associated with molecular correlates (CGG repeat length or *FMR1*-mRNA levels) in any premutation carriers. We conclude that there is a higher prevalence and risk of sleep apnea in patients with FXTAS than controls or carriers without FXTAS. We therefore recommend that all patients diagnosed with FXTAS be screened for sleep apnea given the negative and perhaps accelerative impact sleep apnea may have on FXTAS progression.

Intra-Individual Variability in the Inattentive and Combined Subtypes of Attention-Deficit/Hyperactivity Disorder

Tadeus A. Hartanto
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Psychiatry

Attention-Deficit/Hyperactivity Disorder (ADHD) is the most common childhood behavioral disorder with prevalence rates of approximately 5% and 2/3 continuing to show impairment into adulthood. ADHD is associated with poor attention and/or, greater impulsivity and hyperactivity, social problems and emotional liability. ADHD patients display greater variability (intra-individual variability, or IIV) in response times (RT) on behavioral tasks. It is unknown if greater IIV occurs during reward tasks for ADHD. The present study compared RT between rewards of different magnitude and delay between 40 ADHD (17 inattentive, or IA, and 23 combined subtype, or CO) and 29 controls (HC) on a delay discounting monetary task. RTs were fit to an ex-Gaussian distribution to estimate the central tendency (CT) and standard deviation (SD) of each participant's choice between rewards. A repeated measures ANOVA covarying age indicated a significant group difference for both CT and SD ($F_{2,66}=8.89$, $p<0.001$; $F_{2,66}=3.34$, $p=0.04$, respectively). Post-hoc Bonferroni multiple comparison trends indicate that HCs tend to respond faster than IAs ($p=0.07$) and COs ($p=.13$) and may also be less variable than IAs ($P<0.001$) and COs ($p=0.11$) in RT. This study demonstrates that ADHD is associated not only with increased variability, but also slower response rate in delay discounting tasks.

Representation of War Trauma in Family and Marriage

Arisa Hayashi
Sponsor: Gail Finney, Ph.D.
German

Upon return from war, it is all too common nowadays to witness individuals who display symptoms of Post-Traumatic Stress Disorder (PTSD), a psychological illness that can be just as crippling as the physical injuries acquired on the battlefield. In order to better understand the returning soldier's psychological reactionary mechanisms and dispositions and their repercussions for the marital and familial structure, I will survey Germany's various postwar literary texts by Wolfgang Borchert and Heinrich Böll, as well as filmic works directed by Wolfgang Staudte, Helma Sanders-Brahms, and Roberto Rossellini. I will investigate the protagonist's symptoms of Post-Traumatic Stress Disorder through Freudian psychoanalysis, critically examine his bouts of retraumatization, and analyze his existential despair in the process of homecoming. Fundamentally, I will discuss how these works allude to and centralize the theme of a soldier's individualized war trauma, a theme that predominates in postwar literature, as well as the ways in which this theme modifies character interaction in the work in question.

An Investigation into Gene Expression Patterns of Obligate Symbiotic Frankia Bacteria in *Datisca glomerata* Root Nodules

Jennifer M. Hayashi
Sponsor: Alison M. Berry, Ph.D.
Plant Sciences

Nitrogen fixation is an important process in the environment, providing the biosphere, including auxtotrophic organisms, with a source of chemical nitrogen that is derived from atmospheric nitrogen (N_2). This process is often carried out in symbiotic relationships between a host plant and a bacterial symbiont, or root nodules. One such relationship is that between *Datisca glomerata* and *Frankia bacteria*. This project focused on patterns of gene expression by Frankia in the root nodule. Using ground nodule tissue, RNA was extracted and purified. RT-PCR was subsequently performed at melting temperatures of 55°C, 57°C or 60°C as directed by the optimum conditions for each bacterial primer, aimed to amply bacterial genes such as glutamine synthetase (GS), glutamate syntethase (GOGAT), arginine synthetase (ArgJ)and other such genes involved in the assimilation of nitrogen following the nitrogen fixation cycle. The RT-PCR products were analyzed using gel electrophoresis and subsequent gel analysis. The gel results demonstrated the expression of genes for the enzymes necessary to make up the components of the various pathways. The results of this experiment will be presented, and further analysis of the biochemical pathways between the *D. glomerata* and its obligate *Frankia* symbiont will be discussed.

Predator Avoidance Behaviors of English Sole and Speckled Sanddab on Different Sediment Types

Danielle L. Henderson
Sponsor: Ernie Chang, Ph.D.
Neurobiology, Physiology and Behavior

Flatfish have several well known predator avoidance behaviors. These include reduced activity, change in posture, burial, and color change as a form of camouflage. In the past risk allocation of several flatfish species has been studied with predator exposure via sight and putting them in the same space. Previous students of the Bodega Marine Lab have looked at preferences of sediment types for local species of flatfish. This study combines these two ideas of risk allocation and sediment preference by observing the behavior of English Sole and Speckled Sanddab on four different sediment treatments in direct comparison to their behavior when exposed to a predatory scent cue, which was measured by the eating activity of the flatfish. The flatfish had a specific number of artemia they were given and the remaining number after the trial was subtracted to give a value. The different sediment treatments varied in the size of the sediment (silt versus sand) and if it was packed down or loose. Both species did have a reduction in activity between the control and predator treatments. There was also a reduction in the amount of Artemia that was eaten between the control and predator treatments.

Grain Boundary Effect on Protonic Conduction in Yttrium-doped $SrZrO_3$

John P. Hermens
Sponsor: Sangtae Kim, Ph.D.
Chemical Engineering and Materials Science

Strontium zirconate ($SrZrO_3$) based materials show protonic conductivity at high temperature (~700°C) when doped with aliovalent acceptors. Given the relatively high bulk conductivity and chemical stability during high temperature sintering, this class of materials is considered a promising electrolyte candidate for use in solid oxide fuel cells (SOFCs). The overall conductivity of doped $SrZrO_3$, however, is substantially lower than its bulk counterpart due to the highly resistive nature of the grain boundaries. This limits its development as solid electrolytes used in SOFCs, therefore, the reason for the grain boundary resistivity was studied. To do so, two batches of 5 mol% yttrium-doped $SrZrO_3$ powders were synthesized using two different methods (sol-gel vs. Pechini), then iso-statically pressed and sintered at temperatures above 1650°C, to obtain dense pellet-shaped samples for electrical measurements. Through the use of an impedance analyzer, the electrical resistance contribution from the bulk and the grain boundaries were separated, enabling us to exclusively study the grain boundary effects. We also examine if there is any correlation between preparation method and grain boundary electrical conductivity. Finally, by performing impedance measurements under DC-bias, clues to the reason behind the highly resistive nature of the grain boundaries in $SrZrO_3$ based materials were obtained.

Metabolic Engineering and Synthetic Biology Approaches to Produce Biofuels Directly from Carbon Dioxide

Oliver Glenn V. Hernaez
Sponsor: Shota Atsumi, Ph.D. Chemistry

Current global climate issues have accelerated the need to produce renewable energy. With the contemporary fossil fuel reserves becoming limited and the increasing amounts of carbon dioxide present in the atmosphere, a renewable form of energy can be biologically yielded using microorganisms. One renewable source of energy in particular, biofuels, involves recycling carbon dioxide directly into a useable fuel similar to petroleum-based chemicals. Interest has grown around the use of photosynthetic microorganisms, such as cyanobacteria, due to their capability to directly recycle atmospheric carbon dioxide to fuels using light energy. Our lab has recently demonstrated this approach by engineering the mesophilic freshwater cyanobacterium, *Synechococcus elongatus*, to produce isobutryaldehyde and isobutanol directly from carbon dioxide. These fuel molecules possess superior fuel qualities compared to ethanol; furthermore, the direct conversion of carbon dioxide to product avoids biomass synthesis and degradation. Here, we seek to use metabolic engineering and synthetic biology techniques to improve the production in the engineered *S. elongatus*. The aid of photosynthesis and genetically modifying cyanobacteria will lead to new functional characteristics that will create a more relevant organism capable of producing renewable energy for the future.

Chemoenzymatic Synthesis of Heparan Sulfate Oligosaccharides and Derivatives

Liana Hie
Sponsor: Xi Chen, Ph.D. Chemistry

Heparan sulfate (HS) is a highly sulfated polysaccharide that plays important roles in many biological processes including cell growth, differentiation, inflammation, host defense, viral infections, lipid transport, and metabolism. Heparin, an over-sulfated HS analog, has been widely used as anti-coagulant drugs. Currently, synthesis of HS oligosaccharides by chemical means is very challenging. Enzymatic approach is another promising method to synthesize HS. However, the heterogeneity of the products is inevitable. The ultimate goal of this project is to develop novel chemoenzymatic methods for synthesizing homogenous and structurally defined HS oligosaccharides and derivatives. One-pot multi-enzyme synthesis of fluorescent heparosan trisaccharide GlcAβ1-4GlcNAcα1-4GlcAβ2AA will be carried out under various conditions. This reaction will be catalyzed by glucose-1-phosphate uridylyltransferase (GalU), UDP-glucose dehydrogenase (Ugd), inorganic pyrophosphatase (PpA), and *Pasteurella multocida* heparosan synthase 2 (PmHS2) with uridine 5'-triphosphate (UTP) and nicotinamide adenine dinucleotide (NAD^+) as the cofactors of GalU and Ugd, respectively. Additionally, diverse disaccharide substrates that have already been synthesized in the lab will be used as the substrates for synthesizing HS trisaccharide derivatives. Our results show the combination of the regioselectivity of enzymes and flexibility of chemical reactions in chemoenzymatic synthesis of complex carbohydrates may potentially produce structurally defined HS.

The Superior Milch Animal: *Bubalus Bubalis*

Arielle N. Hines
Sponsor: Edward J. DePeters, Ph.D.
Animal Science

There is an underdeveloped market for true mozzarella cheese in the United States. Americans consume almost 2 billion kilograms of mozzarella annually; about four kilograms per capita. Mozzarella synthesized from dairy cow milk accounts for 99.997% of mozzarella sold, is less palatable, and more affordable than mozzarella made from water buffalo (*Bubalus bubalis*) milk. Restaurants and specialty cheese shops import 137 thousand kilograms of true mozzarella per year (Nicholson, Triumpho). In 2009 there were two American water buffalo dairies and only one in 2010. Three percent of the world's buffalo population is located outside of Asia. The establishment of more buffalo dairies would provide a less expensive, local cheese product. In 2005 University of California at Davis researchers and a prospective dairyman purchased forty-four buffalo from Florida. Estrus detection was difficult to recognize. Animals were artificially bred by *in vitro* embryo transfer. Fifty days following implantation all embryos were rejected by recipients. Climate acclimation negatively impacted heat detection and uterine environment. The energy expense associated with diet deficiency and body heat dissipation may have taken precedence over energy put towards reproduction. Structured breeding and lactation diets, wallow access and an indoor habitat may be necessary for production farms to maintain milking herds.

Cultural Heritage Language in Third Generation Chinese-Americans

Jennifer K. Ho
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Linguistics

Not much linguistic research has gone into third generation Americans in regards to language, and not much is said about them trying to maintain their 'cultural heritage' bilingual abilities, because by the third generation people are assumed to be predominantly English speaking. This study explores if there are third generation Americans that are not monolingual English speakers, and how and why they became successful at learning their heritage language. I collected data by conducting interviews with eight third (or more) generation Americans in their 20s and 70s that were learning or had some proficiency in their heritage language. From the interviews, I identified common features that led to their decisions to learn the language, what language to learn, and what helped them succeed in learning or caused them to give up or take a break. This study finds that learners' successes tend to be based on the learner's participation in the heritage language through areas such as social circles, family, and international pop cultures. The larger implication of my findings is to provide encouragement and guidance to third generation heritage language learners. This study suggests some factors that encourage or discourage later generations from connecting with languages other than English.

Reversals and Reconciliations: The Twilight Phenomenon as Wish Fulfillment

Glenn R. Hoban
Sponsor: Kari Lokke, Ph.D.
Comparative Literature

Twilight, by Stephenie Meyers, has become a phenomenon whose popularity rivals J.K. Rowling's *Harry Potter* and J.R.R. Tolkien's *Lord of the Rings*, despite a low level of rhetoric that alienates it from the literary community. Additionally, Stephenie Meyers' re-imagination of the vampire threatens the very foundations of existing vampire fiction. My analysis of *Twilight* employs psychoanalytic literary theory, a careful combination of Jungian and Freudian dream theory, and Platonic philosophy to suggest that the widespread popularity of this series is largely based on the psychological appeal of a very raw breed of human idealism. More specifically, I find that the text functions as a dreamscape which appeals to collective, unconscious desires to reanimate surmounted infantile beliefs and to resolve competing life and death drives. Furthermore, the unique and obviously potent appeal of the vampire, a classically uncanny entity, suggests that Freud's literary uncanny may have an alter ego in the *Twilight* saga, characterized by what I label "the excessively homey."

Responses to Environmental Stimuli by Orange-winged Amazon Parrots

Kelsey Horvath
Sponsor: Joy Mench, Ph.D.
Animal Science

Orange-winged Amazon parrots (*Amazona amazonica*) in captive environments can develop abnormal behaviors, such as stereotypies, that show individual variation in their development. For the experiment, thirteen Orange-winged Amazon parrots have been bred to examine intra-species differences in response to environmental stimuli. The environmental stimuli used consist of a novel food item which allows for foraging behaviors, a novel object which allows for exploratory behaviors, and an alarm call by conspecifics. It is expected that the parrots will display individual variation in the latency to approach stimuli, the amount of time interacting with the stimuli, and the type of interaction with stimuli. Preliminary results suggest that the alarm call by conspecifics may be too biologically relevant to produce individual variation among the parrots as measured by freezing duration after the alarm call playback. To examine this possibility, an additional startle response test using a less biologically relevant stimulus will be conducted. Preliminary results for responses to the novel food and novel object suggest that the parrots do show individual variation in their latency to approach and the duration of interactions. The individual differences to the environmental stimuli will be tested for correlations with stereotypic behaviors.

Incorporation of a Mutant (A31P) MyBP-C Protein in Feline Cardiac Myofibrils

Seyedeh Maryam Hosseini
Sponsor: Samantha Harris, Ph.D.
Neurobiology, Physiology and Behavior

Cardiac myosin binding Protein C (cMyBP-C) is a sarcomeric protein involved in striated muscle contraction. Mutations in the gene encoding this protein can cause hypertrophic cardiomyopathy (HCM), an autosomal dominant disorder and the leading cause of death in athletes. The (A31P) mutation in Maine Coon cats causes a disease similar to human HCM. In this research, an antibody against A31P was used to specifically recognize the mutant protein in myofibrils isolated from affected cat heart tissue. A second antibody against the C-terminus was used to detect total cMyBP-C protein in affected and non-affected cats. Isolation of myofibrils was done from frozen left ventricular cat tissue. In order to get single myofibrils the tissue was well homogenized, extracted with 1% Triton x100 and washed. Single myofibrils were stained by incubating with primary and labeled secondary antibodies. Image J (NIH) software program analysis of immuno-stained myofibrils showed differences in the relative amount of not only mutant, but also total cMyBP-C. A31P cMyBP-C appeared to be incorporated into sarcomere with a normal distribution, but the relative amounts appeared different in affected and unaffected cats. The microscopic inspections and light intensity comparison indicates that affected cats may have less total cMyBP-C.

Structure of Recombinant HEV Reassembled Particles Encapsidating DNA with HIV Epitope

Benjamin Hsieh
Sponsor: Holland Cheng, Ph.D.
Molecular and Cellular Biology

Hepatitis E virus (HEV) causes acute liver inflammation by fecal-oral transmission. Expression of the truncated capsid protein in a baculovirus system produces virus-like particles (VLP). The VLPs are small icosahedral particles with 60 copies of capsid protein. VLPs can be disassembled in chelating and reducing conditions, and then reassembled with divalent ions. The goal of this experiment is to resassemble the VLP's in the presence of plasmid expressing HIV epitope in order to encapsidate the plasmid and determine the structural integrity of the VLP. A 3D density map of the reassembled VLP was constructed using cryo-EM and Single Particle Reconstruction. The reassembled particle featured pronounced spikes at the two fold region similar to wildtype VLP. Atomic coordinates of HEV truncated capsid protein was then docked into the density map, which fit very well. This indicated stable folding of the truncated capsid protein and that the weak force interactions between subunits is not permanently affected by disassembly conditions. In the center of the reconstruction no pronounced density was seen, possibly from insufficient reinforcement of the DNA density after averaging in the central cavity. Further study is needed to optimize the conditions to package plasmid in sufficient quantities needed for vaccine studies.

Method to Express and Purify Human Proinsulin

Der Yi Hsu
Sponsor: Florin Despa, Ph.D.
Pharmacology

Proinsulin is the prohormone precursor to insulin produced in pancreatic beta-cells. Hyperglycemia, in diabetic patients, induces overloading of secretory compartments in beta-cells resulting in misfolding of proinsulin. Studies have shown that accumulation of misfolded proinsulin causes alteration of insulin biosynthesis and development of diabetes. Our study's objective is to express and purify human proinsulin to better understand how the misfolding is linked to the disease. Methods include subcloning of human proinsulin cDNA into a vector that will fuse a histidine tag at the C-terminal of the protein to purify it using a nickel column. Also, the construct was introduced into BL21 bacteria that carry vector expressing non-bacterial t-RNAs so as to ensure correct expression of the protein. Solubilization of the bacteria through freeze/thaw cycles, lysosomes, and sonication were employed to break down bacteria membrane and DNA. Results have shown successful expression of the protein through the bacteria. However, the protein mainly resides in the precipitate, consisting of bacteria membrane, after centrifugation. We are currently solubilizing the bacteria membrane with different detergents to access the protein. We anticipate that the successful expression and purification of proinsulin will help us to better understand the link between proinsulin folding and diabetes.

Evidence of gp120 Quaternary Shift Upon Ligand Binding in HIV Env Recombinant Immunogen

Jeffrey Hu
Sponsor: Holland Cheng, Ph.D.
Molecular and Cellular Biology

The HIV envelope protein (Env) mediates membrane fusion to host cells through conformational rearrangement. Association between gp120 and gp41 subunits in Env is altered upon binding of gp120 to CD4, HIV's primary receptor. Possible weakening of subunit interaction allows for the coreceptor epitope to become exposed, facilitating coreceptor binding. Analysis of quaternary shifts elicited by CD4m binding using cryoEM was carried out. Truncated gp140 with and without the CD4-mimetic miniprotein CD4m were compared through averaging of top-views. Combining particles increases the signal to noise ratio and is integral to single particle reconstruction (SPR), which derives a three dimensional map of gp140 using averaged particle classes. Top views give more symmetrical rotationally averaged images, which were analyzed by looking at rings of intensity at certain radii from the center. The unliganded gp120 ring compared to the CD4-bound ring shows a significant shift outward after binding, interpreted as a weakening of gp120 and gp41 interaction, and an increase in trimer radius caused by binding of CD4m. Resolving the nature of ligand-elicited quaternary shifts in gp140 could further elucidate HIV's mechanism of infection, opening up more opportunities for effective vaccine and immunogen design.

Effects of Bacterial Mutualists and Soil Type on Leaf Traits in an Invasive California Plant

Xiu Xiu Huang
Sponsor: Douglas Cook, Ph.D. Plant Pathology

Rhizobia bacteria provide legumes with fixed nitrogen in exchange for living space in root nodules and photosynthetic nutrients. The invasive legume, *Medicago polymorpha*, colonized much of North America, including both physiogically stressful serpentine soil and nonserpentine soil at the UCD McLaughlin reserve. However, little is known about how the legume-rhizobium mutualism or soil heterogeneity influences leaf traits. We grew *M. polymorpha* either in serpentine or nonserpentine soil and inoculated with their co-invading rhizobium, *Sinohizobium medicae*, originating either from serpentine or nonserpentine soil. Leaf area and leaf color were measured. In annual plants, leaf size is often positively correlated with fitness. We found that serpentine soil negatively affected leaf size. *M. polymorpha* genotypes displayed trends for leaf size congruent with local adaptation to the soil type: serpentine-originated plants had larger leaves than nonserpentine-originated plants on serpentine soil and nonserpentine-originated plant had larger leaves than serpentine-originated plants on nonserpentine soil. Also, rhizobia originating from nonserpentine soil consistently had greater beneficial effect on leaf size, regardless of the soil type the plants were grown in. In conclusion, we provide some of the first detailed phenotypic information about how co-invading plants and soil microbes interact across heterogeneous soil types to affect legume leaf traits.

The Effect of Substratum Compliance on Endothelial Cell Behavior

Marissa L. Hughbanks
Sponsor: Joshua A. Wood, Ph.D.
Surgical & Radiological Sciences

Cardiovascular disease (CVD) affects more than 81 million people in the United States and accounts for over one-third of all deaths annually. While CVD has generated substantial research efforts, the impact of biophysical cues on disease onset and progression remains poorly understood. This study investigates the role of substratum biophysical cues, in the form of compliance or stiffness, on fundamental endothelial cell behaviors. To this end, vascular endothelial cells (VEC) from four unique vessel sites were investigated on hydrogels with Young's moduli that simulate healthy (25 kPa) and diseased (75 kPa) states. Results demonstrate that substratum compliance impacts attachment, elongation, area, proliferation, and migration. VEC proliferation was significantly ($p<0.001$) decreased on hydrogels as compared to tissue culture polystyrene (TCP) controls. Migration for human aortic endothelial cells (HAEC) and human umbilical vein endothelial cells (HUVEC) were significantly ($p<0.001$) slower on TCP compared to hydrogels. Migration for human saphenous vein endothelial cells (HSaVEC) was significantly slower on the 75 kPa hydrogel and TCP as compared to the 25kPa and 50kPa hydrogels. In contrast, human microvascular endothelial cells (HMVEC) show no significant variation among the hydrogels and TCP. This data demonstrates the need to incorporate substratum biophysical cues for *in vitro* studies.

Assessment of 3D Reconstruction Quality and Resolution Improvement Using Fourier Ring Correlation and Spectral Signal-to-Noise Ratio

Jinwen Hui
Sponsor: Holland Cheng, Ph.D.
Molecular and Cellular Biology

The human immunodeficiency virus (HIV) has envelope spikes protruding from its membrane that mediate membrane fusion. Env is comprised of the subunits gp120 and gp41 in a trimeric array. Binding of gp120 to host CD4 receptors induces a conformational change essential to membrane fusion and thus viral entry into $CD4^+$ cells. Study of Env's quaternary structure is crucial to rational vaccine design, aiming to neutralize HIV's exposed epitopes. The recombinant soluble Env construct gp140 was imaged using cryoelectron microscopy and single particle reconstruction to generate three-dimensional density maps. Careful image processing is required to extract high resolution data from the background noise. Here we analyzed gp140 particles using Fourier ring correlation (FRC) and spectral signal-to-noise ratio (SSNR) to estimate the reconstruction's resolution and possible improvement with additional images. If the FRC and SSNR are strong, we can be confident that the particles contain a higher signal-to-noise ratio (SNR), and by excluding data with low SNR, the resolution and quality of the final reconstruction can improve. The FRC and SSNR particle analyses suggest a higher potential resolution than what has been recently achieved, and some classes have higher SSNR values than others, indicating further improvement is possible.

Effects of Meclofenamate Sodium, a Nonsteroidal Anti-inflammatory Drug, on Proteasome Activity and Myotube Formation in Muscle Cells

Soyun (Michelle) Hwang
Sponsor: Aldrin V. Gomes, Ph.D.
Neurobiology, Physiology and Behavior

Despite present medical advances, cardiovascular disease continues to be the leading cause of mortality in United States, affecting one out of every three individuals. Nonsteroidal anti-inflammatory drugs (NSAIDs) have been increasingly recognized to induce an imbalance of apoptosis regulatory proteins in cardiomyocytes, which precedes heart failure. Normally, NSAIDs like ibuprofen are used on regular basis to reduce pain and fever. While the molecular mechanism by which NSAIDs induce apoptosis is unclear, some NSAIDs including aspirin have demonstrated inhibition of proteasome activity. The proteasome is a multi-catalytic protease complex that degrades misfolded or damaged proteins and helps regulate cell proliferation, differentiation, apoptosis, and oxidative stress response. Meclofenamate sodium (MS) is a NSAID primarily used for acute and chronic rheumatoid arthritis. MS was found to inhibit proteasome activity in both H9C2 (rat cardiac) and CV1 (monkey kidney) cells. At a dosage similar to the maximum clinically recommended amount, 30uM MS added to H9C2 cells exhibited approximately 30% inhibition on proteasome activity. At higher MS dosages, even greater proteasome inhibition occurred. Interestingly, at dosages lower than what is commonly used in adults, MS hindered myotube formation during C2C12 mouse myoblast cell differentiation, indicating that MS also interfered with skeletal muscle development.

Electrochemical Investigation of Galvanic Corrosion Between Glass Fiber/Epoxy Composites Modified with Carbon Nanotubes and 7075 Aluminum

Robert Ireland
Sponsor: Valeria La Saponara, Ph.D.
Mechanical and Aerospace Engineering

Carbon nanotubes are being studied for non-destructive inspection applications, as they create electrically conductive networks in polymers at low concentrations, allowing for in situ health monitoring via measurements of change in electrical resistivity. This conductive network also aids in electromagnetic shielding, and enhances mechanical and thermal properties of conventional fiber-reinforced composites. We investigate whether the presence of carbon nanotubes in previously nonconductive composites causes galvanic corrosion. We focus on aluminum 7075 alloy in electrical contact with glass fiber reinforced polymers (GFRP), where the epoxy resin is modified with multi-walled carbon nanotubes (MWCNT). The occurrence of galvanic corrosion between MWCNT/GFRP and Al7075 is evaluated using standard galvanic coupling tests in electrolyte (2wt% NaCl aqueous, 40 deg. C). These findings are supported by mass loss and resistance measurements taken during month-long immersion tests in: a) a high humidity environmental chamber (95% relative humidity, 23 deg. C); b) an electrolyte solution (2wt% NaCl aqueous, 40 deg. C). Resistivity measurements of the coupled MWCNT/GFRP/Al composites are done using four-electrode methods. Coupling MWCNT/GFRP with Al7075 accelerates the corrosion and mass loss rates two-fold compared to unmodified GFRP with Al7075.

The Effects of Rejection on Levels of Empathy and Envy

Alicia Ivanhoe
Sponsor: Dr. Cynthia Pickett, Ph.D.
Psychology

The goal of this study was to examine the influence of social rejection on individuals' reactions to others. Previous research discovered that rejected individuals become emotionally numb and are less likely to empathize with the plights of others. However, this research only observed empathic responses to others' negative life events. How would rejected individuals' emotional reaction change if they were exposed to another's positive situation? How would this alter levels of envy and empathy in accepted individuals? In the current study, social exclusion was manipulated through a virtual ball-tossing game and participants were presented with a description of another individual's positive or negative life event. After reading the life event participants reported levels of empathy and envy toward the other individual. The results of the study failed to replicate that rejected individuals are less empathetic toward negative experiences of others. However, the results demonstrated that rejected participants were less empathetic and felt more negatively toward individuals who described a positive life event. This research suggests that the pain of rejection may leave people less open to hearing about positive events occurring in the lives of others and may hinder the ability to form secure emotional connections in relationships.

Increasing the Susceptibility of Romain Lettuce to *Agrobacterium tumefaciens* for Protein Production: A Nutrient Study of Calcium and Boron

Lauren Jabusch
Sponsor: Jean VanderGheynst, Ph.D.
Biological and Agricultural Engineering

Romaine lettuce can be used for high-level recombinant protein production using agroinfiltration, which uses the bacterium *Agrobacterium tumefaciens* (*A. tumefaciens*) as a vector to transfer transgenes to the lettuce. This process induces transient transgene expression *in planta*, which could lead to higher yields of recombinant protein than stable expressions and lessens the danger of environmental contamination due to transformation post-harvest. The goal is to increase recombinant protein yields following agroinfiltration of lettuce leaf tissue by altering the nutrients available during growth. Boron contributes to the structure of pectin in the cell wall, with which *A. tumefaciens* interacts. Calcium also contributes to cell wall development. The boron and calcium levels used to grow lettuce will be varied according to a central composite design using a hydroponic system. Following applied nutrient treatment, lettuce will be agroinfiltrated with *A. tumefaciens* containing a ®-Glucoronidase (GUS) reporter gene and GUS transient expression levels will determine the optimal levels of boron and calcium. Biomass will be a marker of plant viability, which is essential to recombinant protein production. This type of expression platform may have many applications in industry as alternatives to cell culture-based expression systems for producing commercial protein products.

The Use of Native Cover Crops in Agriculture Fields

Marissa Jacobi
Sponsor: Mark Van Horn, M.S.
Plant Sciences

My research is a field trial regarding the ability of California native plants to perform as cover crops. Cover crops are not harvested, but typically grown for the purpose of decreasing weeds, rejuvenating soil by adding nutrients, reducing soil erosion, etc. Cover crops are traditionally fast growing plants such as introduced legumes and grasses. My research will explore if cover crops of specifically native plants would work as well as traditional cover crop. Theoretically, native plants could be just as suitable because they naturally grow with the seasons, requiring less water, and they provide ecosystem benefits such as biodiversity and pollination services. My field trial will compare the efficacy of native cover crops versus traditional in the aspect of weed management, measured by percent ground cover of the plants in question. The trial consists of plots of two California native plants (*Phacelia tanacetifolia* and *Lupinus succulentus*), a typical cover crop (*Vicia dasycarpa*), and an unplanted control. In addition to data analysis, the discussion of this research will expand on further questions of the feasibility and benefits of a large scale switch to native cover crops in agriculture.

Midgut pH as a Physiological Barrier to Bacterial Colonization in *Drosophila melanogaster*

Pamela M. James
Sponsor: Artyom Kopp, Ph.D.
Evolution and Ecology

The current paradigm in host immunology, with regards to intestinal bacterial communities, is a complex network of interactions where the host regulates the expression of antimicrobial peptides so that beneficial bacteria are sustained and deleterious bacteria are removed. Little thought is given to the idea of a basic abiotic barrier to microbes such as temperature, pH or salinity. In the *Drosophila melanogaster* midgut there is a region of low pH whose function has not been determined but may play a role in filtering out bacteria from the gut. In order to determine if this acidic zone affects the bacterial community the zone will be alkalized by feeding the flies a carbonic anhydrase inhibitor, Acetazolamide. Then normal and alkalized guts will be dissected and, using quantitative PCR, the bacterial composition of the alkalized guts will be compared to that of the guts with a normal acidic zone. If there are changes in the bacterial composition then this experiment will cast more light on the idea of a less complex pathway for regulation of bacteria in the gut, such as a low pH barrier, and be the basis for future studies in this area.

Human SUN1 and nesprin-4 Functions at the Worm Nuclear Envelope

Zi Mei Jiang
Sponsor: Daniel A. Starr, Ph.D.
Molecular and Cellular Biology

Nuclear positioning is essential for many cellular processes and defects result in human diseases. The nuclear migration pathway in the model worm *C. elegans* involves the SUN protein UNC-84 in the inner nuclear membrane and the KASH protein UNC-83 in the outer nuclear membrane to form a bridge across the nuclear envelope. UNC-83 recruits kinesin-1 to the nuclear membrane to move the nucleus. An analogous pair of nuclear envelope proteins in humans, SUN1 and nesprin4, also recruit kinesin-1 to the nucleus. I hypothesized that *C. elegans* UNC-83/UNC-84 functions analogously to human SUN1/nesprin4 in terms of their function for nuclear migration. To test whether the function of these two nuclear envelope bridges has been conserved, I aimed to replace the SUN domain of UNC-84 with the SUN domain of human SUN1 by cloning an UNC-84-hSUN1 hybrid. I also replaced the KASH domain of UNC-83 with the KASH domain of nesprin4 by cloning an UNC-83-nesprin4 hybrid. I am currently creating transgenics by microinjecting these two clones into *C. elegans*. By studying the functions of human SUN1 and nesprin4 in *C. elegans* nuclear migration I can test my hypothesis that the nuclear bridging functions of these proteins is conserved.

Relationships Among Food Label Use, Dietary Restrictions, and Motivation in Younger and Older Adults

April V. Johnson
Sponsor: Lisa Miller, Ph.D.
Human and Community Development

Food labels are a particularly important source of diet and health information, especially for people who have dietary restrictions. We examined whether adults with dietary restrictions use nutrition facts panels (NFPs) to guide food choices. A second question was whether younger and older adults with dietary restrictions differed in their motivation to eat healthy foods. Participants were younger (18-34) and older (60-80) adults. Of 86 adults, 20 had sodium restrictions (5 younger and 15 older adults). Younger adults were equally likely to consult or not consult the NFPs for sodium content when selecting foods to buy. In contrast, all older adults reported that they consulted sodium on NFPs when considering which foods to purchase. Upon further investigation of these older adults, we found that their motivation (assessed using a measure of state of change) was higher than that of younger adults indicating that they were more likely to be consciously avoiding junk food and dietary fat, and more consciously including fruits and vegetables in their diet. These results indicate that older adults with dietary restrictions may rely more on food labels than those without restrictions. This pattern may due to their higher motivation to follow a healthy diet.

The Cause of the Inelastic Response of Child-Only Cases to the 1996 Welfare Reform

David E. Johnson
Sponsor: Philip Martin, Ph.D.
Agricultural and Resource Economics

The number of welfare recipients peaked at 14,225,651 in 1994, adding pressure to reform the system that provides cash assistance to poor people. In 1996, the welfare system was reformed; substituting a system of two-and five-year time limits for adults and a fixed budget for an open-ended entitlement program. The overall numbers of Temporary Assistance for Needy Families (TANF) welfare cases dropped dramatically since 1996; however, the number of child-only cases has fallen much less. Using cross-sectional/time-series (panel) data from FY1997 to FY2007, I explore various factors to explain why child-only cases respond to different parameters than all TANF cases. I use ols linear econometric regression with 45 different variables and variation of variables. I test against two different dependent variables and many independent variables. I have 561 observations and over 25,000 pieces of datum. I compare significant independent variables with two models: (1) Total welfare recipient caseload (2) total child-only welfare caseload. My findings are interesting and relevant to state and federal welfare policy.

Quantitative Trait Loci (QTL) Analysis of Domestication Traits in Tetraploid Wheat

Jeanice L. Jones
Sponsor: Jan Dvorak, Ph.D.
Plant Sciences

In an attempt to map domestication genes in tetraploid wheat, a cross was made between wild wheat, *Triticum dicoccoides*, and cultivated wheat *T. durum* cv. Langdon. The resulting F1 progeny were selfed or backcrossed to the cultivated parent to create a recombinant inbred line population of 767 individuals and a backcross inbred line population of 539 individuals. The genetic map for this cross was created by genotyping 91 F_2 plants, using the mass-spectrometer based genotyping platform. We created a preliminary map order manually and finalized it by including genetic distances calculated by Joinmap 4. I generated considerable phenotypic data by measuring glume color, spike length, spike width, spike density, and spikelet fertility of the wheat in order to test the hypothesis that by using contrasting parents, I can correlate domestication phenotypes to genotypes via Quantitative Trait Loci (QTL) analysis. That is, loci identified by this analysis would be areas of the tetraploid wheat genome that control domesticated traits. I found interesting correlations between several of our chosen markers and measured phenotypic traits such as spike length. Three markers on chromosome 3A were all correlated to this trait. However, too few markers have been mapped to identify QTLs at present.

Construction and Characterization of a Dual Hepatitis A + E Oral Vaccine Using Virus like Particles

Lesley Jones
Sponsor: R.Holland Cheng, Ph.D.
Molecular and Cellular Biology

Simultaneous outbreaks of HEV and HAV, both enteric transmitted viral hepatitis agents, have resulted in tens of thousands of infections in third world countries. This necessitates the development of oral vaccines, which are cheaper to distribute and safer to administer than current methods. Hepatitis E virus-like particles (HEV-VLPs) are produced from expression of HEV's structural protein, ORF2, truncated at the N and C termini (pORF2). Due to HEV's fecal-oral transmission pathway, the VLPs are resistant to proteolytic enzymes and acidic pH in the digestive system, making them an ideal candidate for oral vaccines triggering mucosal immunity. Previous studies indicate that a heterologous epitope inserted at the C-terminus of HEV pORF2 can be displayed in the protruding P-domain of the capsid to trigger the corresponding immune responses. Here, a selected epitope sequence of Hepatitis A virus will be inserted at the C-terminus of HEV's pORF2 sequence using recombinant DNA technology. Next, the recombinant protein sequence will be transformed into a bacmid, facilitating baculoviral expression of chimeric VLPs in insect cells. After purification, the VLP formation will be verified by TEM, and the antigenicity will be assayed by ELISA. Future work will confirm antigenic response in live animals.

Determination of the Vessel Length Distribution in *Vitis vinifera* Using the Air and Resin Methods

Lindsay M. Jordan
Sponsor: Mark Matthews, Ph.D.
Viticulture & Enology

Xylem is the vascular tissue primarily responsible for transporting water and minerals in plants. In angiosperms, the xylem is composed of multi-cellular conduits or vessels. Individual vessels are separated at their axial ends by pit membranes that permit water transport but inhibit the spread of air. The vessel endings represent important points of axial resistance and the vessel length distribution is believed to play a role in the balance between safe and efficient transport. Previous studies have found a species of *Vitis* to have an average vessel length of 0.6 meters, but the distribution of vessel endings in *Vitis vinifera* is not well documented. The goal of this study was to determine the vessel length distribution using two common experimental methods, the injection of air or resin into cut stems. Because vessel endings block the passage of air or resin, the volume of air exiting a stem or the number of resin filled vessels was measured in progressively shorter stem sections to determine the vessel length distribution. By understanding the vessel length distribution, the hydraulic conductivity through the xylem and any potential effects of embolism or pathogenic movement can be better modeled.

Comparing Remote Interrogation to In-Person Appointments for Patients with Implantable Cardioverter Defibrillators: Patient Perception and Efficacy

Kelly C. Joy
Sponsor: Uma N. Srivatsa, M.D. Internal Medicine

Implantable Cardioverter Defibrillators (ICDs) are treatment for patients at risk for sudden cardiac death. Remote interrogation is often used to monitor these devices. While studies show there are benefits to remote monitoring, there has been little research assessing patient preferences. We hypothesize that demographic factors may influence patient satisfaction with remote or clinic appointments. Questionnaires were mailed to 85 patients with ICDs for ischemic or non-ischemic cardiomyopathy and congestive heart failure with left ventricular ejection fraction<35%. Information regarding education, social support, employment and income was collected. Patients assessed which parameters they consider important: convenience, accuracy, asking questions, human contact, scheduling, and cost. Importance was scored from unimportant(1) to very important(5). Satisfaction was scored from very dissatisfied(1) to very satisfied(5). Results were significant for $p \leq 0.05$. Patients rated higher satisfaction with clinic in accuracy (4.4 vs.3.9, p=0.02) and contact (4.1 vs.3.1, p<0.001); there was no difference in convenience, scheduling or cost between remote and clinic visits. Patients with no college education (3.8 vs.4.5, p=0.04) and income less than $100,000 (3.1 vs.4.1, p=0.005) favored clinic appointments. Most patients favor clinic appointments because they are perceived as more accurate and allow for interaction. Education on remote monitoring benefits will improve efficacy and reduce costs.

Titratable Acidity and Bacterial Composition of Sicilian-style Green Olive Fermentations

Alesia M. Jung
Sponsor: Maria L. Marco, Ph.D.
Food Science and Technology

The production of fermented table olives requires the growth of lactic acid bacteria (LAB) and yeasts in an acidic brine. In 2007, large quantities of California Sicilian-style fermented olives were lost to spoilage characterized by severe degradation of the olive flesh. Post-fermentation examination of those olives showed unusually high numbers of yeasts, many of which exhibited the capacity to degrade pectin in the laboratory. In November 2010, four yeast isolates from defective and normal olives were inoculated into the brines of pilot olive fermentations to examine the effects of those yeasts on olive quality. This project focuses on investigating the titratable acidity of the brines to evaluate this parameter as an indicator of fermented olive quality. This work is also focused on identifying the dominant bacterial species isolated from the fermenting olives and brine. For bacterial identification, the Polymerase Chain Reaction (PCR) was performed to amplify the 16S rRNA genes from the bacterial isolates and the PCR products were then examined by DNA sequencing and taxonomic analysis. These results show that *Leuconostoc*, *Lactobacillus*, *Pediococcus*, and *Weisella* are the dominant LAB in Sicilian-style olives produced in the USA.

Alaskan Thule Ceramic Production and Household Patterns

Justin A. Junge
Sponsor: Christyann Darwent, Ph.D.
Anthropology

Archaeologists describe the Thule as the last major group of hunter-gatherers to occupy the Arctic prior to Euroamerican contact. Originating in the Bering Strait region, the Thule, equipped with whale-hunting technology and pottery production spread out across the Canadian Arctic to Greenland ca. AD 900-1300. One aspect of Thule culture was the construction of well-built, semi-subterranean wood, stone, whalebone and sod houses that were occupied by families for six to nine months of the year. Thule house design and room function has been discerned through ethnographic records and archaeological excavations, but little is known about the specific household activities during occupation. Three Thule houses were excavated at Cape Espenberg, Alaska, in 2010, and radiocarbon dates indicate that these structures were occupied from ca. AD 1300 to 1700. One aspect of their culture that has been little studied is ceramic production and use. Thule ceramic technology included low or non-fired bowls, pots, and lamps that are tempered with organic and inorganic materials. Their pottery was used, re-used, and discarded by occupants of these houses and reflects both pre- and post-house abandonment. This study provides the first detailed spatial and physical attribute analysis of Thule ceramics from the perspective of household organization.

The Independent Libyan State and the Continuity of Political Development

Rima Kalush
Sponsor: Omnia El Shakry, Ph.D.
History

The term "Nation Building" is often used to signify the artificial construction of the Libyan state by foreign powers after WWII; the notion of a synthetic, Western, and United Nations manufactured Libyan state underscores the literature in varying degrees. I seek to challenge the assumptions of artificiality: namely, that the state was conceived absent a political history, absent a united ideational rationale, and independent of indigenous struggles and desires. In order to illustrate the historical continuity of the Libyan nation, I will broadly consider pre-independence to mid 1950s Libya, but I will primarily focus on the early 20th century through the state's establishment. Using primary indigenous accounts and reinterpreting foreign sources, I will attempt to give the indigenous figures who participated in the emergence of their autonomous state a voice, and credit for their struggles. My preliminary findings indicate the continuity of both administrative and ideational structures, the latter of which was undermined rather than coordinated by U.N, British, and French interests. These findings challenge the notion of a revolutionary and foreign-born independent Libyan state, and thus challenge the premises of an artificially created nation.

Novel Wavelet-Based Algorithm for Removal of QRS Complexes from Atrial Electrogram Recordings

Chaoyi Kang
Sponsor: Crystal M. Ripplinger, Ph.D.
Pharmacology

Characteristics of the atrial electrogram associated with maintenance of atrial fibrillation (AF) can be used to target surgical and ablative treatment of AF. However, mapping approaches that allow simultaneous multisite atrial electrogram recordings during AF are limited by noise from QRS complex. A wavelet-based method was developed to remove QRS complexes from atrial electrogram recordings during AF. Electrograms were recorded with a bipolar electrode array on the epicardial surface of canine atria *in vivo*. The surface ECG was used to identify the timing of the QRS complex in electrograms from sinus rhythm (SR) and AF. The QRS complexes during SR in each atrial electrogram were modeled using wavelet transforms (Matlab). AF electrograms were transformed to their wavelet coefficients. The wavelet coefficients of the QRS complex were then subtracted from the wavelet coefficients of the AF electrograms. The new AF wavelet coefficients were then transformed back to the time domain, resulting in AF electrogram free from QRS complexes. Several mother wavelets were first evaluated to determine which best characterized the QRS complex. Coif5 were selected as it has the lowest RMS error. This novel wavelet-based algorithm provides a simple and accurate method of removing QRS complexes from atrial electrograms during AF.

One-pot Preparation of Strain-Sensitive Gold Nanoparticle/Poly(dimethylsiloxane) Thin Film Composites

Mohammad M. Karimzada
Sponsor: Kenneth Loh, Ph.D.
Civil and Environmental Engineering

Elastomers have been applied to various applications ranging from micron-scale molds to DNA and amino acid isolation. In the past decade, elastomers have established a promising place within sensors research - specifically, in the formulation of strain sensors. Gold nanoparticles (GNPs) possess unique optical, chemical, and physical characteristics that enable measureable sensitivity to environmental stimuli. We seek to combine the properties of elastomers and GNPs to develop an optically active strain sensor. The appreciable tensility of elastomers such as polydimethylsiloxane (PDMS)-a clear material with chemical reducing capabilities-seemingly provides an optimal medium to integrate gold nanoparticles and use as a sensor. Using an *in situ* reduction method, we have fabricated a GNP/PDMS thin film composite that utilizes the unique surface plasmon resonance of GNPs to discern the amount of uniaxial strain that the thin film is placed under. This process works by harnessing the elastomer's ability to stretch under strain, thereby decreasing the proximity of nanoparticles in the region under optical study, leading to a direct correlation with Beer-Lambert's Law. Consequently, we have observed a linear relationship between the absorbance of gold nanoparticles and the strain placed on the thin film.

Stages of Integration and Development of the Muslim Community in United States: Post World War II to Present Day

Sana F. Khan
Sponsor: Suad Joseph, Ph.D.
Anthropology

The Muslim community in North America has increasingly become a vibrant and visible part of American society. This development has occurred overtime and in distinctive stages. I will research and outline the multiple phases of Muslim integration and development in American society from the post-World War II period to the current day. I will focus particularly on important stages including the establishment of community organizations, religious institutions, and civil, advocacy, social, and political institutions. A particular focus, I will examine the increase involvement of the Muslim community in the larger American community, including in the medical and legal fields. Additionally, I will examine the increased political empowerment of the Muslim community. In doing so, my research will demonstrate that the Muslim community has shared developmental stages with other immigrant communities and experienced phases unique to the Muslim experience. Like other immigrant communities, Muslim Americans continue to contribute to American society. My research will include reviews of original texts, periodicals, articles, personal interviews, and current media.

Lessons in Organizational Adaptation from the American Federation of Teachers: A Historical Analysis

Amanda J. Khoe
Sponsor: Larry Berman, Ph.D.
Political Science

Once a promising cornerstone of American democracy, today's public education system is failing to equip all students for success in an increasingly competitive global economy. The education crisis has prompted citizens and politicians alike to design, advocate, and implement reforms. Underscoring the search for an education panacea, conventional wisdom argues that teacher unions are to blame for broken schools because they allegedly champion professionalism over student achievement. The following research project will illuminate if and how one teachers union, the American Federation of Teachers, has adapted to the demands of its organizational environment in order to maintain its legitimacy in the modern education reform discourse and to project itself as a guardian of both teacher and student interests. Amidst dramatic changes in the public school system and the greater social and political climate, the AFT has expanded and diversified its mission to respond to environmental shifts. Here, the organizational adaptations of the teachers union will be evaluated in light of its history and within the scope of the broader labor union movement.

The Connectome: Mapping a Path to Understanding Brain Plasticity

Aaron Kian
Sponsor: William DeBello, Ph.D.
Neurobiology, Physiology and Behavior

Visual feedback drives learning in the auditory processing network of the inferior colliculus (ICX) of the barn owl. We have developed a method to induce learning by manipulating this fundamental link between visual and auditory processing. After learning, a novel and active network of synapses coexists with a topographically differentiated dormant network once active prior to induced learning. Many current theories describe how this development occurs. The synaptic clustering hypothesis states that spatially clustered synapses are far more effective at driving postsynaptic activity than declustered synapses. Our goal is to explore this brain plasticity at the synaptic level by building a complete wiring diagram, or connectome, of the ICX. This experiment will lay the anatomical groundwork to definitively test how one group of connections is active while the other is suppressed. We have integrated various techniques for an optimal method to effectively map the ICX, using extremely high resolution imaging via automated transmission electron microscopy (ATEM). We will be measuring wiring changes in the auditory localization pathway in response to a chronically altered visual field by extensively annotating the components of the synaptic network. The connectome will provide critical insight into the precise neurobiological basis of learning and memory formation.

Potassium Channel Overexpression in the VTA Brain Region and its Effect on Social Avoidance

Jihyun Kim
Sponsor: Brian C. Trainor, Ph.D.
Psychology

In mice, social stress can induce behavioral responses resembling aspects of human depression. However, studies in male inbred mice show a surprising degree of individual variability in these responses. Some mice exposed to social stress show high levels of social avoidance (susceptible phenotype) while others do not (unsusceptible phenotype). One mechanism that may be involved is the voltage-gated K+channel (Kir2.1). Mice least affected by social stress have overexpressed Kir2.1 activities, decreasing the firing of ventral tegmental area (VTA) dopamine neurons. In contrast, socially stressed mice fail to show over/underexpression of Kir2.1 activity. Experiments show significant differences in social stress responses between male and female mice. California mice (*Peromyscus californicus*) aggressively defend their territories allowing for the observation of the effects of social defeat. Females show more vulnerability to stress than males with poor explanations. The mice assigned to social defeat were exposed to highly aggressive same-sex breeders for three days. After 4 weeks, western blot will be used to assess Kir2.1 expression in the VTA. If Kir2.1 plays a similar role in California mice as it does in inbred mice, then socially defeated males will have higher levels of Kir2.1 activity than females exposed to defeat.

A Peruvian Pioneer of Photography; Martín Chambi and His Vision of the Andes

Milagritos Kline
Sponsor: Ana Peluffo, Ph.D.
Spanish

Born with a natural eye for the visual arts, Martín Chambi used his talent to depict and portray indigenous cultures in the Peruvian Highlands. His unique photographs capture the mystery and mysticism of the Andes at a time fraught with tensions between competing modernization projects. Chambi's archive contains an extensive collection of unrevealed plaques that capture historical, ethical, and cultural aspects of Peruvian society. My project explores his portrayal of the Peruvian highlands and the cultural information that he transmits through his photographs. Using photography and other cultural materials including articles, previous research, and web based interviews, I will investigate the relationship between photography and the customs and traditions that shape and impact Chambi's visual world. In pursuing this inter-disciplinary project, I expect to enhance my understanding of Martín Chambi's socio-cultural legacy paying close attention to the iconographic representation of "mestizos" and indigenous subjects in nineteenth-century Peru.

Plant Communication: Volatile Organic Compounds Role in Eliciting Plant Defense Mechanisms and How Genetic Relatedness Affects the Elicitation

Christopher J. Knight
Sponsor: Maureen Stanton, Ph.D.
Evolution and Ecology

Previous laboratory studies have shown evidence of inter- and intraspecies plant signaling. When at least one individual is damaged, the volatile organic compounds (VOCs) that are emitted can trigger defenses in neighboring plants. As a class project for EVE 180, we are conducting a field study to test for VOC-induced defenses between plants under field conditions, and to determine whether emitted VOCs have different effects on receiving plants, depending on the genetic relatedness between the receiver and emitter. We are conducting these tests on three plant species, and will compare our results across several families within each species. Due to the lack of field studies, it is our hope that this experiment will help further our knowledge of the role VOCs play in eliciting defense mechanisms of plants in a natural setting. We also hope to determine whether kin selection may be a factor that favors VOC emission, as could be the case if VOCs disproportionately benefit related neighbors.

Within and Between Male Variation in the Mechanical Sounds of the Greater Sage-Grouse

Rebecca E. Koch
Sponsor: Gail Patricelli, Ph.D.
Evolution and Ecology

Communication in some bird species relies not only on vocally-produced calls, but also on mechanical sounds generated elsewhere on the body. I investigated an example of this phenomenon in the "swish" sound of the male greater sage-grouse (*Centrocercus urophasianus*). Sage-grouse congregate on leks during the spring breeding season, where males perform elaborate displays to attract females; most research into mate choice in this species has focused on the vocal components of the display. The swish is a mechanical call produced seconds before the well-studied pops and whistles of the primary display vocalization. Swishes are unusual among mechanical sounds because they are frequency-modulated, which opens up the possibility for immense variation between males. I am analyzing the relationship between the time and frequency of the swish and male mating success to investigate the possibility that swish characteristics act as a signal of male quality or attractiveness to females. Exploring the potential correlation between this mechanical call and male success will broaden our understanding of the purpose of the swish and how it fits into the complex sage-grouse strut, already a model system of sexual selection driven by female choice.

On Intron Mediated Enhancement

Noah K. Kojima
Sponsor: Alan Rose, Ph.D.
Molecular and Cellular Biology

Genes are made up of exons, which specify the structure of a specific protein, and introns, which are often included in the category of "junk DNA" because their functions are relatively unspecified. It has been determined that introns play a role in gene expression in a phenomenon called intron mediated enhancement (IME), which increases the amount of proteins produced from a gene by unknown mechanisms. It was difficult to find the regions of the intron that boosted gene expression because they are poorly conserved and dispersed throughout the intron. By using computation and experimentation, a reoccurring sequence has been identified and seems to be linked to IME. In order to better understand the properties of IME, I will manipulate the sequence by adding and subtracting the number of motifs present in the gene and by changing some of the bases within the nucleotide sequence. It has already been discovered that the IME phenomenon is not specific to plants; IME can also be seen in mammals, insects, and fungus, and could possibly be a universal process within eukaryotes. Studying the mechanism of IME will help mankind better understand life and could increase efficiency in the development and production of value-added crops.

Investigating a Pathway for Nuclear Migration in C. *Elegans*

Jonathan A. Kuhn
Sponsor: Daniel A. Starr, Ph.D.
Molecular and Cellular Biology

The migration of a cell's nucleus plays a vital role in cell movement, development, and differentiation. Failure of nuclear migration has been implicated in a number of human diseases, including lissencephaly (smooth brain disease) and muscular dystrophy. Further work must be done in order to fully understand this phenomenon. My research focuses on two *C. elegans* proteins involved in nuclear migration, UNC-83 and UNC-84. Both of these proteins have functional regions that are highly conserved in mammals. At 25°C, mutations in the unc-84 and/or unc-83 genes prevent nuclear migration in "p-cells" during larval development, leading to defects in the nematode's movement and egg-laying capabilities. At 15°C, however, these same mutants appear healthy and the nuclei migrate normally. I hypothesize that a genetic pathway functions parallel to *unc-84/83* at 15°C. Mutations in this pathway have been identified by forward genetic screens. I will attempt to clone genes in this pathway using both traditional genetic mapping and new genomic sequencing technology which allows us to scan an entire genome for mutations in a quick and cost-effective manner. Locating these genes will lead to understanding the structure and function of the proteins they affect.

Engineering a Biological Copper Detoxification System

Lydia E. Kwon
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

Copper is an essential trace metal required for various bodily functions. However, an excess intake of copper may result in nausea, while further consumption over a period of time results in liver and/or kidney damage. This research is half of a two-part project that proposes an inexpensive solution to this issue in the form of a smart biological system-"smart" in that it is able to sense specific concentrations of copper and produce a copper-sequestering protein accordingly. This system utilizes a specific metallothionein-proteins that prevent metals from reacting in unwanted reactions by binding them-to sequester excess copper. CUP1, which has a high affinity for copper, was extracted from baker's yeast (*Saccharomyces cerevisiae*) and combined with its native CUP1 promoter. CUP1 expression is regulated by the ACE1 transcription factor, which was modified to its essential metal-binding and DNA-binding sites (as provided in literature) to reduce waste of resources. This system, when inserted into bacteria, should only produce the CUP1 metallothionein in the presence of excess copper in the environment. In the long run, the general idea behind the biological detoxification system will hopefully contribute to the detoxification of various different metals, not just copper, in the environment.

Pyridostigmine Bromide Protection Against Acetylcholinesterase Inhibition by the Organophosphate Pesticide: Chlorpyrifos

Helen Lam
Sponsor: Barry Wilson, Ph.D.
Environmental Toxicology

The widespread use of organophosphate (OP) pesticides, such as chlorpyrifos (CPO), underline the importance of adequate safety measures to protect mixers, loaders, applicators, farmers, and the public. The experiments presented here concern pyridostigmine bromide (PB), a carbamate, treatment as a means to reduce the effects of the OPs on farm worker exposures. Red blood cells (RBCs) from the UC Davis dairy herd were incubated with PB, CPO, and appropriate controls to investigate the extent of PB protection of acetylcholinesterase (AChE), an enzyme important for nerve impulse transmission and present in mammalian RBCs. The RBC samples were collected, washed in saline, and assayed in triplicate using the colorimetric Ellman assay to determine AChE activity. The experiments show that the AChE in RBCs treated with PB and CPO were protected but did not recover. RBCs pretreated with PB recovered approximately 42% of their activity. RBCs treated with CPO alone were inhibited 93% with no recovery. Combined treatment of PB and CPO showed 85% protection of AChE activity. These results support the conclusion that PB treatment can provide protection from OP exposure.

Effects of MuRF-1 on Adipogenesis in Mice Muscle Primary Cells

Helen C. Lam
Sponsors: Sue C. Bodine, Ph.D. and Keith Baar, Ph.D.
Neurobiology, Physiology and Behavior

The Muscle Ring Finger-1 (MuRF-1) gene encodes an E3-ubiquitin ligase, which links ubiquitin molecules to proteins. MuRF-1 has been found to be upregulated during atrophy conditions and is thought to tag proteins for degradation, controlling the proteasome-dependent degradation of muscle proteins. However, its true function is still largely unknown. *In vivo*, MuRF-1 knockout mice have slightly larger muscles, evidence of increased protein synthesis, resistance to certain types of atrophy, as well as down-regulated adipogenic genes following glucocorticoid treatment. Since severe muscle wasting can lead to adipogenic conversion of muscle cells (Kim et al J Orthop Res. 2010 28:1391), we hypothesized that primary muscle cells isolated from MuRF-1 knockout mice would be less adipogenic than wild-type control cells. Methods: Primary muscle cells from WT and MuRF-1 KO mice were treated with adipogenic induction media for six days. Following induction, the cells were stained with Oil Red O to detect triglycerides and lipids. The stained cells were observed microscopically and stain retention was quantified spectrophotometrically. Results: MuRF-1 knockout cells show differences in phenotype following the treatment indicating less adipogenesis. Because the sensitivity of staining has been insufficient to show differences in lipid content, we will use rt-PCR to quantify adipogenic gene expression.

Targeted Bladder Cancer Therapy and Imaging

Vinh Q. Lam
Sponsor: Paul T. Henderson, Ph.D.
Chemistry

Doxorubicin (DOX) is a commonly prescribed chemotherapy drug. DOX penetrates cells and binds to genomic DNA, causing cell death in many tumor types. However, DOX kills normal cell types resulting in toxic side effects and restriction in the maximum tolerated dose. Our research aims to target bladder cancer by attaching DOX to a peptide carrier. The peptide PLZ4 shows strong binding affinity and specificity for bladder cancer cells. PLZ4 binds to overexpressed cell surface molecules called integrin receptors in bladder cancer cells, which then transports the peptide inside the cell. PLZ4 may ferry DOX to the tumor site and kill the cancer cells while reducing harm to non-cancer cells. We are synthesizing DOX conjugated to PLZ4 and testing the ability of the molecule to penetrate and kill bladder cancer cells. Because DOX is fluorescent, confocal microscopy will be used with fluorescent imaging to quantify the uptake of PLZ-DOX conjugates into cultured bladder cancer cells. The ability of PLZ4-DOX to kill the cells will be tested in comparison with conventional DOX therapy. This research aims to eliminate the adverse effects of chemotherapy treatment by targeting bladder cancer cells by binding the PLZ4 to integrin receptors over expressed by bladder cancer.

Mobile Banking Kenya: The Growth of an Industry

Joseph W. Lawlor, Jr
Sponsor: Chris Benner, Ph.D.
Human and Community Development

The global financial services industry accounts for the majority of international trade. It has been estimated that, by the late 1970's, traditional financial service markets were close to saturation (Dickens, 2007). This saturation, paired with widespread deregulation of the industry, has lead investors to pioneer ways to increase investment possibilities. One of these innovations, mobile banking, is the topic of this research. Kenya, where mobile banking did not exist until 2006, now has over 12 million users, just four years later (Gates Foundation, 2010). In Kenya, the industry is dominated by a service called M-Pesa (M for mobile; Pesa is the Swahili word for money). This analysis aims at unwrapping the economic forces behind the Kenyan mobile banking phenomenon. In three sections, the research describes the economic climate of Kenya which has made M-Pesa so successful, provides case studies that give practical insight into the industry's ability to promote economic development, and analyzes the industry's present and future effects. This analysis will provide an answer to the central question, why has M-Pesa been so revolutionary, and why in Kenya?

Measuring Kinetics of Plasticizer Release from Biopolymer Films in Foods

Phuong B. Le
Sponsor: Nitin Nitin, Ph.D.
Biological and Agricultural Engineering

Biopolymer films have attracted a lot of interest from researchers and food manufacturers as an alternative form of packaging. Biopolymer films are biodegradable and overcome some of the environmental concerns associated with traditional plastic packaging. In particular, whey protein (WPI) films have been widely researched as an option for biopolymer film packaging. In the production of these films, plasticizers such as glycerol, polyethylene glycol 200, sorbitol, and beeswax are used to modify mechanical and barrier properties of films. However, there is limited understanding of the effect of these plasticizers on the growth of bacterial pathogens in foods. The goal of this research is to study the release kinetics of the aforementioned plasticizers in WPI films. In order to prepare the films, 5% (w/v) WPI was mixed with 1-5% (w/v) plasticizer in distilled water. The solution was heated at 90°C for 30 minutes, followed by pouring into a cast mold. The release rate of plasticizer from the films onto lettuce leaves and meat was measured using fluorescence and UV-vis spectrophotometry. The results from this study will be applied to investigate the effect of plasticizers released from WPI film on the growth of bacterial pathogens in foods.

Soy Peptide Lunasin as a Peptidomimetic of Human Tumor Suppressor ANP32A

Quoc sinh Le
Sponsor: Raymond Rodriguez, Ph.D.
Molecular and Cellular Biology

Previous studies have shown that ANP32A, a human tumor suppressor protein, and Lunasin, a 43 amino acid peptide from soy, have the ability to inhibit histone acetylation (INHAT activity). Acetylation of core histones by histone acetyltransferase (HAT) as well as INHAT activity are important mechanisms for regulating cell growth and development at the transcriptional level. The objective of this study was to identify the domain in the Lunasin peptide that confers the INHAT activity by replacing the INHAT domain of ANP32A with different length of the Lunasin peptide. A series of recombinant fusion proteins between ANP32A and Lunasin were constructed. Using western-blot analysis with antibodies against acetyl-histone 4 (H4), we showed that one fusion protein carrying the C-terminus of Lunasin was capable of inhibiting HAT reactions catalyzed by two different HATs (p300 and pCAF). We concluded that the C-terminus of Lunasin contains an INHAT domain structurally and functionally similar to that found in ANP32A. This evidence supports the hypothesis that Lunasin is a peptidomimetic of a human tumor suppressor.

Understanding the Role of Structure-Selective DNA Endonucleases in DNA Repair

Robert H. Le
Sponsor: Wolf-Dietrich Heyer, Ph.D.
Microbiology

The genome is essential to life as it provides the code for the production of proteins and RNAs that function in the well being of all living things. However, it is continually under the stresses of mutation, deletion, and breaks in its constituent DNA that can result in the generation of defective gene products or cause lethality. To combat these challenges, evolution has provided enzymatic pathways to recognize and repair damaged DNA by utilizing the method of homologous recombination, the physical exchange of DNA strand pairing between regions of homologous sequence. In addition, recombination provides crucial support for DNA replication in the revival of stalled replication forks, contributing to tolerance and maintenance of DNA damage. Although the end result of these pathways is generally clear, the individual steps of each pathway are not. This is the focus of my project: using genetic approaches in the model organism *Saccharomyces cerevisiae* to better understand the interactions and roles of nucleases during repair of breaks in double stranded DNA, in order to fathom how cells carry out genome maintenance.

Resolving the Effects of Progesterone During Hormone-Induced Lactation

Annah Lee
Sponsor: Russell Hovey, Ph.D.
Animal Science

The objective of our study was to study the effects of progesterone during induced lactation in nulligravid Holstein heifers throughout the months of January to mid-March by administering the anti-progesterone agent RU-486. In order to stimulate lactation, the heifers were injected once daily with 0.075 mg/kg of estradiol and 0.25 mg/kg of progesterone on days 1-7. On days 18 and 19 an injection of dexamethasone (15 mg/day at 1 ml per heifer per day) was administered in order to initiate cell differentiation prior to lactation. On day 19 the heifers were then divided into two groups (n=4/group) that received either a single injection of ethanol vehicle or RU-486 (0.5 mg/kg). On the following day, all heifers commenced milking. Blood samples were collected from day 1 to day 16 in order to measure alpha-lactalbumin levels to reveal the integrity of tight junctions between epithelial cells during the onset of lactation. Throughout the experiment, the class recorded teat measurements and took photographs daily in order to assess mammary gland growth. By the end of this study our analysis of mammary gland development and milk production will have indicated the role of progesterone during the onset of lactation.

The Effects of Culture and Emotion Regulation on Cognition in Biculturals

Gavin C. Lee
Sponsor: Wesley G. Moons, Ph.D.
Psychology

Prior research on emotion regulation suggests that different regulatory styles (e.g., expression vs. suppression) have different consequences on cognition (Richards and Gross, 2000). Members of different cultures regulate their negative emotions differently. For example, American culture promotes expression of emotions, whereas Chinese culture emphasizes emotion suppression. The current study examined how the degree of congruence between activated cultural norms and emotion regulation style affected subsequent cognition. We hypothesized that when primed with their Chinese culture and asked to suppress their negative emotions (congruent condition), Chinese American biculturals would exhibit enhanced cognitive function. However, when primed with Chinese culture and asked to express their negative emotions (incongruent condition), this would diminish their cognitive function. We primed 73 Chinese American biculturals with either their Chinese culture, American culture, or no culture (neutral condition). They then viewed a disgusting film clip in which we asked them to either express, suppress, or just watch the film clip normally. They then completed a measure of cognitive depletion. We found that Chinese Americans experienced cognitive depletion after the incongruent condition, whereas they experienced cognitive enhancement after the congruent condition. Implications for how social support is most effective when accounting for one's cultural background are discussed.

Effects of Oxidative Stress on Gut-Associated *Lactobacillus plantarum*

Krista Lee
Sponsor: Maria L. Marco, Ph.D.
Food Science and Technology

Certain strains of *Lactobacillus plantarum* are added into food products to confer health benefits in the gut. These probiotic strains should remain viable in the food product and possibly during gastrointestinal (GI) transit. During food production and passage through the GI tract, bacteria may be exposed to oxidative stress, which can affect their viability. The present study aims at describing *L. plantarum* growth in oxidative environments. Two strains of *L. plantarum* were grown in a laboratory medium in aerated (oxidative) and static (control) conditions. Growth rate and yield were determined by spectrophotometry and colony forming unit enumeration of the bacteria at different time points during growth. These comparisons have thus far shown that the two strains exhibit different growth rates and that both are affected by the presence of increased oxygen levels in growth medium. Under aerated conditions, the growth rate decreased for both strains, while the yield increased for one and decreased for the other. This study shows that *L. plantarum* is affected by oxidative stress in a strain dependent manner.

Understanding Media Choices: The Effects of Boredom on Media Preferences

Michelle C. Lee
Sponsor: Laramie Taylor, Ph.D.
Communication

This study explores the general motivations and predictors of media entertainment choices from the mood management perspective. More specifically, this study examines the effects of boredom on selection of different genres of media, links between personality traits and media preferences, as well as correlations between digit ratios and media choices. Research participants are invited to complete a two part survey containing 84 items, followed by the collection of their palm prints. The first part of the survey includes measurement of the subjects' personality traits, sensation seeking habits and positive and negative affect. Subjects are then introduced to a twenty minute long monotonous task for boredom induction purposes, before they complete the second part of the survey which investigates their media choices. Any identity indicators that provide links to a specific participant, including the palm print data, are destroyed immediately after use. All research participants are recruited from the University of California, Davis, through fraternities, communication classes and an online recruitment ad targeting undergrads. Subjects recruited from communication classes are offered no more than 2 points of extra credit from their instructors, while other subjects receive candy bars as reward for their participation.

Microalgal Biomass as a Species-Specific Indicator of Lipid Content

Erin F. Lennon
Sponsor: Kate Scow, Ph.D.
Land, Air, and Water Resources

A high lipid content in microalgae is vital if biofuels derived from these organisms are going to be competitive with fossil fuels. Determining species-specific lipid-biomass relationships could be helpful in improving microalgae biofuel production because it could provide a predictive ratio that would minimize expensive measurements of microalgae properties. This study compares lipid-biomass ratios for isolated *Chlorella minutissima marina* (UTEX2341), *C. sorokiniana* (UTEX2805), agricultural wastewater microalgae (RR1), as well as a 1:1 (biomass) UTEX2341:2805 mixed strain cultured in a universal medium. Lipid-biomass ratios are obtained through a calculated optical density (OD) - biomass relationship in conjunction with a modified Bligh and Dyer lipid extraction method. All treatments grew in N8Y medium with 20% salinity, although RR1 required 40% salinity for sufficient growth. In N8Y 20%, the OD-biomass relationships for isolated UTEX strains were best determined at 680nm, with $r^2 \geq 0.90$. Biomass of UTEX2341, 2805, and the mixed strains was harvested and stored, and lipid content will be determined after freeze-drying three replicates per treatment. Results will indicate if microalgae biomass can be a useful, species-specific indicator of total lipid content.

Modifications of the TIN2 Gene in Human Cells Using Zinc Finger Nuclease

Heather Leo
Sponsor: Lifeng Xu, Ph.D.
Microbiology

Telomeres are nucleoprotein complexes that contain sequences of "TTAGGG" DNA repeats. Located at the ends of chromosomes, telomeres require shelterin, a complex comprised of six proteins bound to the "TTAGGG" repeats, to shape these ends into loops and prevent them from being mistakenly recognized as a DNA double stranded break. Recently, mutated forms of one of the shelterin proteins, TIN2, have been linked to the disease dyskeratosis congenita(DC). To elucidate the role mutant TIN2 plays in DC and to study how TIN2 modulates telomere function, we will duplicate the TIN2 mutations in an experimental system by creating human cells heterozygous for TIN2 point mutations. Using customly designed sequence-specific zinc finger nucleases(ZFN) to assist gene modification, we will introduce mutations into human cells. To optimize the conditions for the experiment, pairs of ZFN monomers with varying 3, 4, 5, or 6 recognition-domains were transfected into human cell lines, Hela1.2.11, UMUC3, and HT1080A6. When transfection efficiencies reached 40-50% in UMUC3 and HT1080A6, genomic DNA was purified and analyzed for ZFN efficiency using Surveyor Assay. Preliminary data shows that the combination of 4 and 5 ZFN domains on each monomer produces optimal results. Conditions for transfection in Hela1.2.11 with ZFNs need further optimization.

Age-Related Changes in the Dopaminergic Modulation of Retinal Ganglion Cells in the Rat

Casey Lester
Sponsor: Andrew T. Ishida, Ph.D.
Neurobiology, Physiology and Behavior

Evidence exists that dopamine is an important neurotransmitter in the modulation of retinal ganglion cell response to light in the rat. Further, it has been demonstrated that the dopamine receptor D1 is involved in this regulation. In the presence of bound ligand, this G-protein coupled receptor triggers a cascade of events that leads to an increase in intracellular cAMP. Evidence of changes in dopamine response that correlate with aging is well-documented in the psychomotor and other systems. Additionally, limited evidence indicates age-related differences in dopamine response in the retinal system of the rat and mouse. In this study intracellular cAMP levels in retinal ganglion cells of post-natal, adult, and aged adult rats will be quantified the presence and absence of dopamine will be evaluated *in vitro*. Intracellular cAMP concentrations will be determined using an ELISA technique: Retinal ganglion cell extracts will be mixed with a solution containing anti-cAMP antibodies and horseradish peroxidase labeled cAMP. The concentration of cAMP will be directly proportional to the displacement of horseradish peroxidase-labeled cAMP from the antibody, and thus inversely related to the measured level of fluorescence. It is expected that significant age-related differences in intracellular cAMP levels in response to dopamine will be observed.

Hibernating Hamsters Exhibit Enhanced Neuroprotection At Low Temperatures

Carly J. Lewis
Sponsor: Barbara Horwitz, Ph.D.
Neurobiology, Physiology and Behavior

During arousal from hibernation, brains of hibernators may experience hypoxia as a result of the increased energy expenditure that rewarms the animal. Previous studies showed that following anoxic insult, hippocampal neurons of non-hibernating Syrian hamsters (*Mesocricetus auratus*) were more neuroprotected than those of rats, a nonhibernator. I tested the hypothesis that in addition to this species difference, hippocampal slices from hibernating hamsters would be more neuroprotected at colder than euthermic temperatures. We measured responses to anoxic exposure on population spike amplitude (PSA) in CA1 pyramidal cells every minute throughout the experiment. Following a 15 min control period in oxygenated artificial cerebrospinal fluid (aCSF), oxygen was replaced with nitrogen for 15 min. Slices were then returned to oxygenated aCSF for a 30 min recovery period. Six minutes after nitrogen exposure at 35°C, PSA had an 81± 4.7% (mean ± standard error) drop from control values, while a smaller drop (56.3 ± 9.2%) occurred at 30°C and remained small as temperature was further decreased. Differences are significant ($p < 0.05$), consistent with my hypothesis, and suggest that the greater hypoxic tolerance at lower temperature contributes significantly to hippocampal neuroprotection during hibernation and arousal (Supported by a President's Undergraduate Fellowship to CL.)

Improvement of Thermoelectric Performance of Mg_2Si/Si Nano-Composites

Shawn X. Li
Sponsor: Susan Kauzlarich, Ph.D.
Chemistry

Thermoelectric materials are valuable because they can generate an electric potential using waste heat. Magnesium silicide, Mg_2Si, has recently been under close scrutiny as a favorable thermoelectric material for its abundance, low cost and environmental friendliness. Efficient thermoelectric materials need an optimal carrier concentration and should possess low electrical resistivity and low thermal conductivity. In this study, we have investigated a new synthetic route, Mg_2Si + nano-silicon, where we dope the material with bismuth to control carrier concentration. However, Mg_2Si has a fairly high thermal conductivity. In order to reduce the thermal conductivity, additional silicon nanoparticles are added to the Mg_2Si matrix via mechanical mixing to achieve a homogenous distribution. The silicon nanocomposite is expected to act as scattering center to increase phonon scattering; in turn, reducing the thermal conductivity. The synthesis and characterizations will be presented.

Couples, Young Children, and the Division of Labor

Abbie S. Lieberman
Sponsor: Diane Wolf, Ph.D.
Sociology

How do couples balance their responsibilities in the home with their responsibilities in the workplace? Have the roles of men and women as spouses and parents changed in recent generations? Is this generation any different from the last in terms of sharing responsibilities? When Arlie Hochschild first published her book *The Second Shift* in 1989, she claimed that American families were experiencing a stalled revolution. By this she meant that women had entered the workforce but were still held responsible for the vast majority of domestic duties. Are women still responsible for the majority of domestic duties in their households? In this research project I interview twelve couples in Northern California (roughly between the ages of 25 and 35) with at least one child under five years of age. This paper focuses on the trends found among these twelve couples and attempts to address why or why not gender roles have changed in recent years.

Is Resistance to Anoxia-Induced Calcium Influx the Mechanism for the Neuroprotection Exhibited by Hibernating Hamster Hippocampi?

George H. Liepart
Sponsor: John M. Horowitz, Ph.D.
Neurobiology, Physiology and Behavior

Population spike amplitude (PSA) has been used as a tool for assessing neuronal function in the hippocampus following anoxic exposure. Prior work from our lab has shown that hibernating hamsters (HH) are more resistant to the effects of anoxia than euthermic hamsters (EH) or rats. The mechanism by which the HH hippocampus is more resistant to anoxia is unknown, but altered calcium influx had been proposed. I hypothesized the resistance of HH hippocampus to anoxia is mediated through a diminished anoxia-induced calcium influx, which can initiate apoptosis. After obtaining a baseline PSA, I subjected hippocampal slices from both EH and HH to an anoxic bout lasting 15 minutes, then allowed them to recover for 30 minutes. Extracellular calcium concentrations during anoxia alternated from slice to slice from 2mM to 4mM for both EH and HH. PSA was recorded during the entire duration of anoxia and recovery. The data suggests there is no discernable effect of increased calcium concentration on PSA in either EH or HH hippocampal slices during exposure to and recovery from anoxia, thus negating my hypothesis.

Catalytic Conversion of 4-Methylanisole

Ryan R. Limbo
Sponsor: Bruce Gates, Ph.D.
Chemical Engineering and Materials Science

Interest has been increasing in catalytically upgrading lignocellulosic bio-oil compounds via oxygen removal, with the goal of making transportation fuels. The conversion of 4-methylanisole (a representative constituent of bio-oil) with H2 was investigated with supported platinum catalysts, including platinum on alumina and platinum on silica-alumina. Reactions were carried out in a flow reactor at 573 K and 140 kPa, and the effluent was analyzed by gas chromatography-mass spectrometry. Dozens of products were identified, the most significant being toluene, 4-methylphenol, and 2,4-dimethylphenol, all of which were formed with each catalyst. Plots of selectivity vs. conversion were used to identify primary and higher order products. The significant reaction classes included hydrogenation, hydrodeoxygenation, and transalkylation. Kinetics of the formation of major and minor products were determined , and results were compared with those characterizing the reactions of anisole. Acidic and supported metal catalytic activity was compared by relating the product yields of each catalyst. A reaction network of products was developed accounting quantitatively for the primary reactions, and an extended qualitative reaction network developed to account for all the products.

International Students Lacking Cultural Competence: Desire, Motivation, and Ability in Forming Friendships with Native Students

Iris Lin
Sponsor: Erin Hamilton, Ph.D.
Sociology

International students face language, cultural, academic and social issues, in adjusting to life in their host country. Research has found that social support and connectedness are vital assets in dealing with and overcoming such challenges. Coming from a different country, a student may have trouble understanding the cultural norms here. Without this understanding, they would lack the ability to read social cues or correctly interpret meanings of interpersonal interactions; which may hinder their success in forming close friendships with native students. Many international students cite learning about American culture as a goal for studying abroad here, and culture is learned primarily through social interactions. Thus, if an international student was able to successfully form a connected bond with members of the student population, this would indicate achievement of 1) understanding and integrating into American culture and 2) gaining social support to help them overcome or deal with challenges they may face. This can be an indicator of their overall satisfaction of their study abroad experience. This research project will focus on the experiences of international students on the UC Davis campus. Comparisons will be made between students of different host countries/cultures and length of stay (a quarter vs. four years).

Chemotaxis to Chemical Attractants by *Pseudomonas putida* F1

Pamela Lin
Sponsor: Rebecca Parales, Ph.D.
Microbiology

Pseudomonads are motile bacteria that are widespread in nature and are known for their metabolic diversity. These organisms have the ability to sense and respond to chemical concentration gradients using a process called chemotaxis. Pseudomonads have a conserved chemotaxis system that is homologous to that present in *Escherichia coli*. *E. coli* has 5 methyl-accepting chemotaxis proteins (MCPs), which serve as receptors for the detection of attractant compounds. In contrast, *Pseudomonas putida* F1 has 27 MCP-like genes in its genome. In order to identify the functions of the MCPs in strain F1, mutants with deletions of each of the 27 MCP-like genes were constructed and screened for defects in chemotaxis to a variety of chemicals. Using the swarm plate assay, we found that *P. putida* F1 mutant (Δ4894) had reduced responses to succinate, malate, fumarate and citrate. The swarm plate assay consists of a low percentage agar plate with a chemical attractant. As the bacteria consume the chemical, a concentration gradient develops and the bacteria swim outward towards a higher concentration and form a ring. Further studies are being done to determine whether the mutation can be complemented by inserting the specific MCP gene back into the mutant.

Hybrid Soy Protein Isolate Fibers by Electrospinning

Xingchen Liu
Sponsor: You-lo Hsieh, Ph.D.
Textiles and Clothing

Soybean Protein Isolate (SPI) has potential to become an important chemical resource for the preparation of environmentally friendly materials.The so-called "soy protein" fibers that are produced through wet spinning are mostly synthetic and contain less than 20% soy protein particles dispersed in a polymer matrix.The project is to explore the denaturation of SPI to improve its solution properties to enable electrospinning to generate hybrid SPI/PVA fibers with more than 50% SPI content.The effects of denaturation conditions, i.e., temperature, heating time and pH, solubility in water as well as aq. urea as well as solution properties were investigated. The results showed that increasing the degree of protein denaturation, i.e., heating for longer time and adjusting to extremely basic condition, gave rise to decrease in solution viscosity. Urea didn't play a role in improving the solubility of SPI, but could help to avoid the heat-induced gel of SPI during heating process. None of the pure SPI solutions could be spun into fibers. With the addition of fiber-forming polyvinyle alcohol (PVA), uniform fibers could be achieved by electrospinning. Solution properties were modified to allow electrospinning with higher SPI contents in the fibers. Structure and properties of fibers were analyzed.

Using Portable Landfill Devices to Convert Waste into a Community Building Resource and as a Waste Awareness Campaign

Samantha M. Lubow
Sponsor: Frank J. Loge, Ph.D.
Civil and Environmental Engineering

Today essentially everything is wrapped in plastic that is destined for landfill. UC Davis currently strives towards Zero Waste by 2020. We divert recycling and compostable materials, but many plastic materials are still landfilled. Can plastic waste be converted into a resource? Portable Landfill Devices (PLDs) are plastic bottles stuffed with plastic trash until they are compressed as bricks. Participants washed, cleaned, and dried their plastic film trash and then stuff the material into clean 20oz. plastic bottles using a stick to ensure optimal compression. The bottles were then weighed to calculate both the mass and estimated volume of waste diverted from landfill. The bottles became actual building bricks, used in the construction of a cob bench on campus. Bottle bricks were stacked, just like bricks, using earthen building material as a natural concrete. A large number of students played an integral role in this project; students accumulated building material, provided labor, and engaged in experiential learning. This project symbolizes the commitment to Zero Waste and the immense educational potential of the Sustainable Living Learning Community, a community currently being planned by faculty, staff, and students on the UCD campus.

Emotion Regulation in Middle Childhood

Natalie M. Lucia
Sponsor: Ross A. Thompson, Ph.D.
Psychology

The present study examines children's understanding of their emotions during middle childhood. It sets out to investigate whether children report different emotional coping responses depending on the person whose actions cause the negative emotion; whether there are gender differences or age differences in coping responses; and whether certain coping responses are associated with appropriate social behavior with peers. Participants include first and fourth grade boys and girls. The study introduces the Emotion Regulation Interview, a self-report measure designed to examine children's prospective coping responses (i.e. problem solving, adult intervention, aggression, avoidance, social support, and venting) when faced with hypothetical situations in which a parent or peer evokes the child's anger. The Social Skills Improvement System (SSIS) questionnaire, a parent-report measure of socially appropriate behavior was also administered. It is hypothesized that boys will be more likely than girls to report externalizing responses to anger and that first graders will be more likely to report seeking an authority figure to cope with anger than fourth graders, whom are predicted to be more self-reliant in their coping. Finally, it is hypothesized that children with more constructive coping will also have SSIS scores reflecting greater socially appropriate behavior.

The Effect of Biophysical Cues on the Behavior of Canine Mesenchymal Stem Cells

Irene Ly
Sponsor: Joshua A. Wood, Ph.D.
School of Veterinary Medicine

Mesenchymal stem cells (MSCs) are multipotent stem cells with the capacity to differentiate into an array of cell types from the mesoderm. With their regenerative properties, they hold immense therapeutic potential for advancements in tissue engineering and repair. Traditionally, cells including MSCs are grown on smooth, flat surfaces *in vitro* - a factor that fails to effectively replicate the natural basement membrane (BM) that cells adhere to *in vivo*. Composed of a rich matrix of collagen pores and fibers, the BM has previously been shown to provide biophysical cues in the form of topography that significantly influence fundamental cell behaviors. To investigate the impact of substratum topography on MSC behavior, canine MSCs derived from adipose tissue were cultured on nanotopographic surfaces (400-4000nm) of varying shape and pitch (pitch = feature width + groove width) that recreate the known topographic characteristics of the BM. Preliminary results demonstrate that these topographic cues have a profound impact on the proliferation, migration, and alignment of MSCs. These experiments offer valuable insight on the nature of MSC response to substratum biophysical cues and inform more effective application of these cells for regenerative medicine.

Fabrication of Biocompatible and Ingestible Gelatin Nanofibers

Maria Ly
Sponsor: You-Lo Hsieh, Ph.D.
Textiles and Clothing

Gelatin, hydrolyzed collagen, is a natural protein found in the extracellular matrix of connective tissues including bone, skin, and tendon. Gelatin has a unique property of amphoterism, possessing acidic, basic and isoionic properties in the right conditions. This means gelatin can be manipulated to control its reactivity with surrounding chemicals in the environment. Gelatin is biocompatible and non-immunogenic and has shown wide applications for cell adhesion and differentiation. However, prior reports of electrospinning gelatin involved toxic solvents such as 2,2,2-trifluoroethanol (TFE). The goal of this work is to electrospin gelatin nano-fibers from nontoxic, non-harmful aqueous solvents, enabling the gelatin nanofiber mats ingestible for food and drug applications. In controlled concentrations, acids can improve the solubility of gelatin while also improving its ability to be electrospun compared to water alone. Formic acid is one such solvent and is non-toxic in small concentrations. However, the solution viscosity changes significantly with compositions, possibly inhibiting electrospinnability. Thus variable formic acid and water concentrations were studied to determine the optimal aqueous solvent and solution condition to electrospin into fibers. The gelatin nanofibers were further crosslinked using genipin, a fruit extract, to render them insoluble in water.

Fashionable Skin

Jennifer Ma
Sponsor: Susan Avila, M.F.A.
Design

My clothing line, "Fashionable Skin" for men and women, takes inspiration from skin both conceptually and structurally. Clothing acts as an extension of a person's natural skin; a simple way to protect against the elements. People are always trying new ways to renew their skin. Molting is the process of renewal; generally speaking, people frequently associate molting with animals, both reptiles and mammals. Most people do not realize that humans also go through the same process. A person's skin changes with different climates; it will peel off and newly grown skin replaces it. Merging this process with fashion, I am able to create Fashionable Skin. The collection incorporates dyeing, silk screening, and printing to reproduce different animal and human skin prints (i.e. finger prints). Different sewing techniques such as shirring, draping, and distressing the fabrics are all used to create the effect of molting skin. Combining these techniques allows me to develop all the visual component of my garments and create new body skins.

Construction of a Plasmid for the Visualization of Xylella fastidiosa in Grapevines

Kevin Ma
Sponsor: Michele Igo, Ph.D.
Microbiology

Xylella fastidiosa is a pathogenic bacterium that causes Pierce's Disease and other xylem-based plant diseases across North and South America. Affecting grapevines, Pierce's Disease is a serious threat to the wine and grape industries of northern California. How might the presence and migration of *X. fastidiosa* be tracked inside grapevines? Here, I describe the construction of a plasmid that will facilitate the insertion of a red fluorescent protein gene into the chromosome of *X. fastidiosa*. This plasmid carries DNA homologous to sequences that flank a chromosomal neutral insertion site (NS1); previous studies have established that recombination into NS1 does not impact *X. fastidiosa* cell physiology or virulence. An additional advantage of using chromosomal recombination is that the inserted gene is stable without selective pressure. Using this plasmid, I will insert a red fluorescent protein gene into the *X. fastidiosa* chromosome, which should cause the bacterium to fluoresce red. Thus, this plasmid and fluorescent protein system will be useful for visually tracking the presence and migration of *X. fastidiosa* in grapevines and provide insight into the physiology and behavior of the pathogen while inside the grapevine.

The Relationship of Diet and Health in an Ancient California Population

Madeline Mackie
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

Diet and health are related measures that reflect the overall quality of life within a population. Archaeologists have different means to reconstruct diet and health and can examine long-term changes over time, and how the two are related. This research examines Nitrogen and Carbon stable isotope ratios in bone collagen and apatite from about sixty burials at a prehistoric site found just outside Fairfield, California (CA-SOL-11) to determine the diet of the population. Nitrogen isotopes reflect the tropic level of protein intake, while Carbon isotope ratios reflect the influence of marine vs. terrestrial sources of food. Quality of diet will be defined by the presence of high tropic level protein. General health will be designated by overall stature, age at death, the presence of enamel hypoplasias, and any diseases present. Once diet is determined it will be compared to the individual's health to see if there is any correlation. I expect to see a correlation between the quality of diet and the overall health of the individual.

Numerical Simulations of Electrostatically Induced Aggregation and Coalescence in Polydisperse Emulsions

Graham R. Magill
Sponsor: William D. Ristenpart, Ph.D.
Chemical Engineering and Materials Science

Although electrostatic coalescers have long been used to separate emulsified water droplets from oil, the dynamics of droplet aggregation and coalescence remain poorly understood. The aggregation is believed to be primarily driven by induced dipolar interactions between droplets, suggesting that increasing the electric field strength should increase the rates of aggregation and coalescence. However, recent evidence suggests that coalescence is inhibited above a critical field strength. Here we numerically investigate the dynamics of coalescence of polydisperse emulsions. The simulations are based on induced dipolar interactions between point dipoles in a parabolic flow. The limiting case of negligible hydrodynamic interactions and immediate coalescence upon contact is examined in detail. Within this regime we observe a plateau in the rate of droplet coalescence above a critical electric field strength, a result with practical implications for the design of commercial coalescers. We compare the numerical results to previous experimental work, and we discuss the implications for optimizations of electrostatic coalescers.

Design and Analysis of a Small Hybrid Engine Aircraft

Mateusz J. Malinowski
Sponsor: Cornelis Van Dam, Ph.D.
Mechanical and Aeronautical Engineering

This research project documents the engineering design of a two-place hybrid-electric general aviation aircraft, performed as part of the EAE130 capstone design course under the mentorship of Professor C.P. van Dam. As part of a new trend towards green energy, a hybrid-electric aircraft with similar performance to existing gasoline-powered aircraft was designed using analytical and empirical methods. The performance requirements were one-hour cruise endurance at 80 knots, take-off and landing performance over a 50 foot obstacle using no more than 1600 feet of runway, and a reasonable acquisition and maintenance cost. An internal combustion engine is allowed, with a maximum fuel load of one gallon. This strives to create an economically and technologically realistic aircraft with a smaller carbon footprint. Using empirical and analytical methods, a candidate design was chosen to fulfill these design goals and analyzed for viability. Finally, suggestions for design improvements and further refinement in prototype and production aircraft will be presented. This project is in the process of data collection, and final conclusions will be available at time of presentation.

Maximizing Trinucleotide Repeat Retention in *E. coli*

Allison M. Manderfield
Sponsor: Paul J. Hagerman, Ph.D.
Biochemistry and Molecular Medicine

Fragile X syndrome (FXS) is the most common heritable form of mental retardation and Fragile X associated Tremor/Ataxia Syndrome (FXTAS) is a debilitating adult-onset neurodegenerative disorder. FXS and FXTAS are caused by expansions in the CGG trinucleotide repeat sequence in the 5' untranslated region (UTR) of the FMR1 gene. In studying the molecular mechanisms of FXS and FXTAS, many experimental approaches require cloning CGG repeat sequences for downstream applications. However, trinucleotide repeats are inherently unstable in *E. coli* and cloned CGG repeats are often deleted from plasmids in culture. This deletion provides easier plasmid replication and a growth advantage. This phenomenon poses a challenge for *in vitro* study of CGG repeats. This project aims to develop a recommended protocol for more effective culture of *E. coli* harboring CGG repeat-containing plasmids. Systematic collection of quantitative data compares the stability of trinucleotide repeats in different growth conditions. Repeat insert length is determined before and after culturing using restriction digest and agarose gel electrophoresis. Ongoing examination of repeat retention in various combinations of plasmid types, bacterial densities, and media composition is revealing an optimum combination of factors. Use of this recommended protocol will aid in preventing trinucleotide plasmid deletions in continued FMR1 research.

Sympathetic Innervation of Target Tissues is Altered in Rats with Subchronic Exposures to the Organophosphorus Pesticide Chlorpyrifos

Linley M. Mangini
Sponsor: Pamela J. Lein, Ph.D.
Molecular Biosciences

Organophosphorus pesticides (OPs) are the most commonly used pesticides in the United States and worldwide. While much is known about the acutely toxic effects of OPs, the mechanisms underlying the neurotoxicity associated with chronic low-dose exposures are poorly understood. The objective of this research is to determine whether chronic exposure to one of the more widely used OPs, chlorpyrifos (CPF), alters neuronal connectivity in the sympathetic nervous system. Adult male Long Evans rats were injected daily for 4 or 10 days with 250µL of vehicle (peanut oil), 3mg/kg CPF or 10mg/kg CPF. The rats were euthanized on day 4 or day 10 and the superior cervical ganglia (SCG) and the salivary glands, a primary target of the SCG, were harvested and fixed with 4% paraformaldehyde. Salivary glands were stained for tyrosine hydroxylase, the rate-limiting enzyme in the synthesis of epinephrine and norepinephrine and a marker of sympathetic axons to assess sympathetic innervation. SCGs were stained for Bassoon, a pre-synaptic marker, and PSD-93, a post-synaptic marker, to visualize synaptic density. Initial results indicate that CPF decreases sympathetic innervation in the submandibular salivary gland, suggesting a novel mechanism to explain the autonomic dysfunction reported in humans exposed chronically to OPs.

Can Histamine Act on Multiple Hippocampal Regions to Prolong Hibernation Bout Duration?

Anna D. Manis
Sponsor: John M. Horowitz, Ph.D.
Neurobiology, Physiology and Behavior

Previous studies show that histamine injected into the hippocampus of hibernating ground squirrels lengthens bout duration. A regulatory circuit may offer an explanation for this effect: CA1 and CA3 regions of the hippocampus project to the ascending arousal system (AAS), inhibiting these neurons, and thus inhibiting arousal from hibernation. If histamine excites CA1 and CA3 pyramidal cells, the inhibitory effect of the hippocampus on the AAS would be accentuated. In this study, I tested the hypothesis that histamine modulates excitability in both CA1 and CA3 regions of the hippocampus. Using 16 hippocampal slices from Syrian hamsters, evoked responses were recorded with glass microelectrodes in the CA1 and CA3 before, during, and after histamine perfusion. The data showed enhanced excitatory responses in both areas following addition of histamine to the perfusate. These results support my hypothesis that histamine stimulates CA1 and CA3 regions of the hippocampus, enhancing signaling over two distinct pathways, a neocortical pathway from CA1 and a more direct descending pathway from CA3 to the AAS. As a result, histamine activation of pyramidal neurons in the hippocampus appears able to extend hibernation bout duration.

Determining the Origin of Longtail Macaques Using SNPs on mtDNA and Microsatellites (STR)

Gretchen P. Marcelino
Sponsor: David G. Smith, Ph.D.
Anthropology

DNA was extracted from blood samples of longtail macaques (*Macaca fasicularis*) originating in five different geographic locations (Vietnam, Cambodia, Indonesia, Philippines and Mauritius) to identify genetic characteristics unique to each region. As longtail macaques from all five regions are employed as animal models in biomedical research and those from different geographic regions are suitable for the study of different human diseases, genetic tests for confirming the alleged geographic origin of research subjects is imperative. An 835 base pair sequence of mitochondrial DNA (mtDNA) was amplified using the polymerase chain reaction (PCR) to identified single-nucleotide polymorphisms (SNPs) in samples from each region. For example all DNA sequences from all Vietnamese samples might differ from all Cambodian DNA sequences at a single base-pair location. This information is useful to confirm the region of origin of samples from these two regions. We also used PCR-amplified tetranucleotide microsatellites or short tandem repeats (STRs) to compare allelic sizes and frequencies between samples from different regions. Capillary electrophoresis was used to characterize alleles at each STR locus by their size. Our goal was to identify a set of SNPs and STR loci that will differentiate the animals from each region from those of all other regions.

Can Point Mutations in Kinetochore Proteins Create Haploid Plants in *Arabidopsis thaliana*?

Brenda Marin
Sponsor: Simon Chan, Ph.D.
Plant Biology

Haploid plants accelerate breeding by creating instantly true-breeding varieties. We have developed a new method to generate haploid plants by manipulating centromeres, the chromosome structures that mediate genetic inheritance during cell division. An important regulator of centromere function is the centromere-specific histone CENH3, which replaces histone H3 in centromeric nucleosomes. When *Arabidopsis thaliana* plants expressing transgenic altered CENH3 proteins are crossed to wild type, chromosomes from the mutant parent were lost at a high frequency, resulting in haploid plants with only chromosomes from their wild-type parent. Many countries refuse to use transgenic plants as part of their agricultural practices. Therefore, I am isolating CENH3 point mutants to test the hypothesis that non-transgenic plants with centromere defects can also act as haploid inducers in *Arabidopsis thaliana*. Three point mutations have been created in CENH3 by chemical mutagenesis (TILLING). Plants homozygous for these mutations have a normal phenotype, unlike the embryo-lethal phenotype seen for *cenh3* knockouts. I have crossed homozygous mutant plants to wild-type, and will determine the seed abortion rate and the ploidy of the progeny. If haploids are created by a non-transgenic *cenh3* mutant, it will greatly broaden the applicability of our powerful new breeding method.

The Role of Religious Institutions in the Rwandan Genocide

Victoria N. Martin
Sponsor: Keith D. Watenpaugh, Ph.D.
Religious Studies

In April of 1994 almost a million and a half Rwandans were killed by members of their own communities and churches in what is known today as the Rwandan Genocide. Through my research I hope to understand why this happened. The interest for the research is the role of religious institutions like that of the Catholic Church and the largely Christian populations that were living in Rwanda. My research will examine the issues pertaining to religious establishments and how they correlate to the political power struggles that were going on before the genocide took place. Research such as this is important to understand so that events like this cannot continue to happen. By understanding the dynamics of multiple factors that lead to genocide, an understanding of how to prevent genocide can also be achieved. My research has been mainly text-based though I was able to conduct an interview with a survivor of the genocide. I will demonstrate my conclusions via a thesis and presentation. The conclusions to my research will hopefully allow for a greater understanding to prevent genocides from continuing.

Ancient DNA and Ancient Migrations at a 4000-Year Old Archaeological Site in the California Delta

Naomi L. Martisius
Sponsor: Jelmer W. Eerkens, Ph.D.
Anthropology

Ancient Northern California shows a distinctive burial pattern between 4500 and 2500 years ago, with people on the coast burying their dead in a flexed position and people in the Sacramento Valley burying their dead in an extended position with the head pointing west. It has been hypothesized that Penutian speakers migrated into the Sacramento Valley bringing not only a distinctive burial style with them, but also a unique genetic composition. Previous research with ancient mitochondrial DNA (mtDNA) has suggested a common ancestry among coastal populations, while inland groups show a separate common ancestry. Recent excavations at a site near Brentwood, CA, between the coast and the Sacramento Valley revealed over 500 burials, with a mix of flexed and extended-west, and dates between 3000 and 4000 years ago. Twenty burials, ten flexed and ten extended, were tested for mtDNA to determine haplogroups. Each sample was further divided into male and female. This aDNA analysis is an important strategy in piecing together the gap of our understanding of ancient California and ancient migrations.

Nuclear Expression of the MUC1 Extracellular Domain Protein

Lindsay Martsching
Sponsor: Gordon Douglas, Ph.D.
Cell Biology and Human Anatomy

The mucin, MUC1, is a large transmembrane glycoprotein expressed at the apical plasma membrane of epithelial cells and over-expressed by epithelial tumor cells. The cytoplasmic domain of MUC1 can be transported to the nucleus where it is involved in the regulation of transcription. As expected, the extracellular domain is generally described as being associated with the plasma membrane. Surprisingly, when we stained rhesus monkey trophoblast cells using a MUC1 extracellular domain antibody followed by immunofluorescence microscopy, the results suggested expression within the nucleus. Using confocal microscopy and siRNA studies we confirmed that MUC1 extracellular domain protein is expressed as speckles within the nucleus of trophoblasts as well as human breast cancer cells and normal colon cells. Double staining experiments showed that nuclear MUC1 extracellular domain colocalized with spliceosome components within interchromatin granule clusters. To further test this, we used an in situ proximity ligation assay (PLA). The results showed abundant bright fluorescence spots in the nuclei of cells stained using MUC1 and spliceosome antibodies and the PLA probes. Controls failed to show fluorescence. The results show that the extracellular domain of MUC1 is expressed in the nucleus and associates with spliceosomes where it may have a functional role.

Cell Adhesion and Sex Comb Development in the Fruit Fly Drosophila melanogaster

Setong W. Mavong
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Evolution and Ecology

Calcium-based adhesion molecules (cadherins) are involved in cell-cell adhesion. E-cadherin plays a role in cell-cell adhesion via the binding of actin filaments as a major component of adherens junctions. In *D. melanogaster*, E-cadherin is encoded by the gene shotgun (shg). Currently, the role of shotgun in the development of the sex comb, an evolutionarily dynamic arrangement of bristles on the first legs of Drosophila males of many species, is unknown. We found that reducing expression of shotgun using RNA interference (RNAi), under the control of the UAS-GAL4 and temperature-sensitive GAL80 system, at the specific time in development when the sex comb forms, results in comb bristles that fail to join into a contiguous formation and lack the wild-type longitudinal orientation. Shotgun down-regulation appears to disrupt comb formation by degrading cell-cell adhesion between comb bristles and/or the cells surrounding the sex comb. A better understanding of the molecular basis of these phenotypes could help explain the diversity in Drosophila sex combs across sister taxa. In a broader context, a better understanding of E-cadherin can aid in addressing many issues of medical relevance, including metastasis in breast cancer.

Development of Small Molecule Inhibitors of the Androgen Receptor DNA Binding Domain as Targeted Anti-Cancer Drugs for Prostate Cancer

Anisha Mazloom
Sponsor: Kit S. Lam, M.D., Ph.D.
Biochemistry and Molecular Medicine

The androgen receptor (AR) within prostate cells can be activated by the presence of an androgen to bind to DNA and initiate transcription. AR is over-expressed in prostate cancer cells, making it a prime target for potential treatments. Current prostate cancer drugs, known as selective androgen receptor modulators (SARMs), specifically target the ligand binding domain of AR, preventing dimerization and attachment to the DNA. However, in prostate cancer cells, AR often mutates, allowing it to dimerize and initiate transcription despite the presence of SARMs. The purpose of this study is to target the DNA binding domain of AR to prevent DNA attachment and transcription. *In silico* screening of NCI-Diversity Set II resulted in the identification of seven hit compounds, which were used to design and synthesize several series of compounds. Thus far, some of the synthesized molecules have shown cell killing ability against prostate cancer cell lines, such as LNCap and CWR22Rv1, at low μM levels. In addition, the active compounds inhibit prostate specific antigen (PSA) production in cells, verifying that the compounds target AR. Further optimization of the lead compounds is underway. Success in this endeavor could lead to novel targeted therapy for prostate cancer.

Soybean and Arabidopsis SPEECHLESS Paralogs Exhibit Functional *Equivalence in planta*

Tyler J. McCubbin
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Plant Biology

Soybean (Glycine max) is an important plant for human consumption and is gaining ground as a model organism for higher plants. Like all plants, soybean uses stomata, structures present on leaf surfaces that facilitate gas exchange, for photosynthesis; the differentiation pathway that forms stomata is initiated by the SPEECHLESS gene. Previous microarray expression experiments identified several important soybean genes for seed development, one of which was a paralog of the *Arabidopsis SPEECHLESS* gene that is critical for the development of stomata. Our current work seeks to determine what role this gene, *Gm-SPEECHLESS*, plays in soybean's development. We created a loss-of-function mutant using RNA interference that will "turn off" the endogenous *Gm-SPEECHLESS* gene. We observed that the phenotypic effects of the mutation are similar to the *Arabidopsis* null mutant *At-speechless*.To test functional similarity between soybean and Arabidopsis paralogs, we transformed *Arabidopsis speechless* mutants with *Gm-SPEECHLESS* cDNA clones controlled by the *At-SPEECHLESS* promoter. This restored normal phenotype, indicating that the soybean paralog is capable of complementing the loss of the native gene in *Arabidopsis*. This indicates that soybean's paralog of *At-SPEECHLESS* exhibits functional equivalence *in planta*, and this gene plays a critical role in the genetic mechanism for controlling stomata development.

The Medicines Patent Pool: How Essential is it for Increasing Access to Antiretroviral Medication in Developing Countries?

Micaela McNulty
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Agricultural and Resource Economics

By 2009 the global HIV/AIDS epidemic had reached approximately 33 million people. While HIV can be treated with antiretroviral (ARV) medication, many people with the disease live in poverty and lack access to treatment. In September 2010 the National Institutes of Health (NIH) licensed its patent for an ARV drug to the Medicines Patent Pool, a mechanism intended to increase access to ARVs in developing countries by driving down ARV prices. How likely are these price reductions to affect access to ARVs in developing countries? Using data from 31 sub-Saharan African countries between 2007 and 2009, I statistically analyze the relationship between ARV prices and access to treatment, including other key variables such as GDP per capita, health infrastructure and conflict. I find that when controlling for time, price and access have a statistically significant and *positive* relationship. When controlling for country, however, price and access have a statistically significant and *negative* relationship. While this suggests that falling ARV cost is indeed associated with broader access to ARVs, the relationship is not robust when controlling for a time trend. Overall, the results suggest that ARV cost is unrelated to access in the short run. Data limitations prevent longer run analysis.

Effects of Different Gelling Agents on the Number and Diversity of Microbial Isolates Recovered from Soil

Amela Mehmedovic
Sponsor: Michael Toney, Ph.D.
Chemistry

The effects of using two different gelling agents on culture media: Gelrite and agar, were evaluated by isolating microorganisms from soil. Approximately half the amount of Gelrite compared to agar can be used to solidify media, and published studies claim that Gelrite does not contain toxic contaminating ingredients such as those found in agar. Three different media containing agar as the gelling agent, and three corresponding media containing Gelrite were prepared and poured into petri plates. Soil samples were diluted in sterile water to 10^{-5}, 10^{-6}, and 10^{-7}. Each dilution was plated onto the six different media plates. Plates were incubated at 25°C for two weeks, and colonies were counted. The number of unique colonies, based on morphology, that grew per plate were recorded. The isolated microbes were also tested for herbicidal and insecticidal activity. Preliminary results show no significant variation in the number of unique colonies isolated amongst different nutrient broths when using one gelling agent over the other. Considerable disparity in the number of unique colonies between different culture media was observed.

An Empirical Model Characterizing the Material Properties of Tendons and Ligaments as a Function of Age and Loading History

Steven M. Meinert
Sponsor: David Hawkins, Ph.D.
Neurobiology, Physiology and Behavior

The incidence of musculoskeletal overuse injuries is rising. This increase is likely due to increases in the training schedule associated with many youth sports programs and a lack of understanding of basic injury mechanisms. Repetitive loading of musculoskeletal structures can cause micro trauma that, without sufficient recovery time, can accumulate and lead to gross injury. Understanding how the mechanical properties of musculoskeletal structures are affected by age, gender, physical activity history, etc. is fundamental for developing effective training programs that minimize injury risk. The purpose of this investigation is to derive an empirical model that characterizes the affects of age and activity history on the material properties of tendon and ligament. Stress-strain data reported in the literature for tendons/ligaments from animals and humans of varying age and physical activity level were used to determine values for coefficients A and B in the equation stress=A·(e^(B'strain)-1) that provided a good fit to the data. Preliminary analyses indicate that a constant value of 4.5 for the A coefficient with a B coefficient equal to 0.1 for immature and sedentary individuals and 0.2 to 0.5 for mature and/or physically active individuals fit the data reasonably well for strains less than 5%.

Genome-wide Analysis of KRAB-ZNF Binding and their Role in Recruitment of KAP1

Emmanuel V. Mendoza
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Molecular and Cellular Biology

Cys2-His2 (C2H2) zinc finger proteins are the largest family of transcription factors in the human genome, comprising approximately 700 different proteins. An important feature of zinc finger proteins is that each can have 1 to 30 zinc finger domains and each domain can bind to 3 base pairs of DNA. My research focuses on the largest sub-class of C2H2-ZNF proteins known as the Kruppel-Associated Box Zinc Fingers (KRAB-ZNF), which contain a KRAB domain believed to be involved in repression by recruitment of the co-repressor KAP1. I am studying 10 different KRAB-ZNF genes, each encoding proteins containing a variable number of ZNF domains. My goal is to identify genomic targets for these ten KRAB-ZNFs. High-throughput technologies such as chromatin immunoprecipitation followed by whole genome sequencing allows the identification of a protein's DNA binding sites to a high degree of resolution (ChIP-seq). As an initial step, I am testing to see if exogenous expression of a FLAG-tagged ZNF cDNA in combination with an anti-FLAG antibody is a suitable reagent for ChIP-seq assays and can substitute for an antibody against an endogenous protein. Cause-effect relationships between KRAB-ZNF binding and recruitment of KAP1 can be elucidated if overlap exists between these DNA binding sites.

Screening and Investigating Interactions Between Haloarchaeal Species

Darach Miller
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Biomedical Engineering

The engineering of microbial consortia holds great promise for solving many practical problems facing humankind. In order to deliver on this promise we must understand the patterns of functional interconnections not only within a species but also with different species (genometypes) and with its abiotic environment. One approach to developing understanding is to take the experimental approaches and theoretical concepts used to analyze the way a single genotype computes a response to stimuli and apply them to a system of multiple interacting genotypes. This study seeks to lay groundwork to study microbial consortia ecology by screening for interesting interactions in candidate halophilic archaea systems. We screened growth phenotypes among pairwise combinations of various haloarchaea, which have shown three dominant interesting patterns in contrast to single species cultures: (1) Pairwise growth similar to an isolate alone, (2) enhanced pairwise growth and (3) impaired pairwise growth. Further research can elucidate the genetic basis of these interaction, which can be compared between coevolved and non-coevolved systems to shed light on the functions and histories of microbes as communities. This direction should help us to understand ecologies as we understand microbes and provide insight into the engineering of microbial communities for the common good.

Binding Processes in Episodic Memory

Sandra Mineyev
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Center for Neuroscience

An important question regards how we combine aspects of an event together to form a coherent representation of an 'episode' in memory. Addressing these issues, participants performed a memory task involving learning a list of colored words represented on either the top or bottom of the computer screen. For condition 1, subjects were told to remember the words as well as color and position of these words; in conditions 2 and 3, subjects were asked to remember the words and either color or position, respectively, and in condition 4, subjects were told to ignore color and position information and to only remember the words. Results showed different patterns for color and position. When color was encoded explicitly, memory for position was unaffected compared to explicit learning of both features. However, when position was encoded explicitly, memory for color was compromised when compared to explicit learning of both features. Because color differentially facilitated position compared to position facilitating color, our results suggest that color may serve as a potential implicit cue for position. One implication for our results is that implicit retrieval cues account for some part of what is often assumed to be explicit binding processes in episodic memory.

Vocalizations During Play: An Early Indicator of Autism?

Claudia A. Miranda
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Psychiatry

Impaired social communication, including the delay or absence of spoken language, is one of the defining characteristics of Autism Spectrum Disorder (ASD). This prospective longitudinal study explores infant language use (vocalizations) at six, nine or twelve months as an early ASD marker in seven children who later develop an ASD. Within this study infant vocalization, including duration and frequency, are compared with those of a gender and age matched comparison group of typically developing children. We hypothesized that those infants who developed an ASD vocalized less often and for shorter durations during play interactions at six, nine, or twelve months when compared to the matched comparison group. Preliminary analyses did not reveal lower levels of vocalizations in children who later developed ASD. Although the samples size was not large enough to detect moderate to small effects, we hope that this study will act as a model for larger studies in the future.

Determining the Functions of Mus81-Mms4 Phosphorylation Sites in *Saccharomyces cerevisiae*

Vaishali Mittal
Sponsor: Wolf-Dietrich Heyer, Ph.D.
Microbiology

Homologous recombination represents one mechanism of DNA damage repair during the S and G2 phases of the cell cycle. Several proposed DNA intermediates are predicted to form during the reinitiation and repair of stalled replication forks. The Mus81-Mms4 complex functions as a structure-selective endonuclease during recombinational repair. It also acts in eukaryotic meiosis and is presumed to cleave joint molecules that occur during meiotic recombination. Its cellular function may be regulated by covalent modification, specifically phosphorylation. The objective of this project is to screen phosphorylated serine and threonine sites that were identified by mass spectrometry for functional importance. Using site-directed mutagenesis, targeted sites are substituted with alanine to prevent phosphorylation. Their function is then monitored by assays to test for growth and viability defects in the presence of genotoxins. We have successfully integrated two sets of mutations of *mms4* and are currently integrating mutants of *mms4* and *mus81* that disrupt specific kinase consensus sites, including the DNA damage response kinase, Mec1, and cell cycle regulator CDK. Finally, we will make combination mutants that contain both mutant Mus81 and Mms4 proteins and perform the same analysis on these combination strains.

Functionalized Nanoparticles for Site-Specific Chemotherapy: DNA Linkers and Radiation-Induced Ligand Release

Larissa K. Miyachi
Sponsor: Ting Guo, Ph.D. Chemistry

Although chemotherapy is a vital component of modern cancer therapy, the distribution of free drug throughout the body often produces severe side effects and limits the dosage that can be safely administered. This can result in incomplete elimination of malignant cells and subsequent cancer recurrence; thus, a method for site-specific drug release is desirable. This study focuses on developing an activated-release system in which chemotherapeutic drugs are attached to gold nanoparticles (AuNPs) via cleavable linkers that can be selectively severed to liberate the drug molecules. DNA strands were utilized as linkers due to their susceptibility to cleavage by hydroxyl radicals, which can be generated directly by AuNPs upon irradiation with x-rays. Using the fluorescent dye 6-carboxyfluorescein (6-FAM) as a drug substitute for initial studies, we synthesized 6FAM-DNA-AuNP conjugates, irradiated the samples, and determined the release efficiency. We were able to obtain radiation-induced ligand release from the 6FAM-DNA-AuNPs, providing proof-of-concept of their utility in selective drug release. Future research includes maximizing release efficiency, synthesizing doxorubicin-conjugated AuNPs for use in further radiation studies, and testing the functionalized AuNPs in cancer cell lines. Through this work, we hope to increase the efficacy of chemotherapy and improve the quality of life for cancer patients.

Innovation in Plant Biology: A Sociology of Scientific Knowledge Perspective on the Effects of Interdisciplinary and International Collaborations

Clare Mjolsness
Sponsor: Patrick Carroll, Ph.D.
Sociology

My honors thesis project is based on my observations of a plant biology lab and how they are able to be innovative and stay competitive in their field by using creative social methods. My research focuses specifically on how the lab uses international and interdisciplinary collaborations to find innovative ways of using technology and thus producing groundbreaking research. The lab is a plant biology lab that works on simulating the plant stem cells of the meristem plant. The work at the lab could help cancer research, agriculture research, and research on genetics in general. They are a very successful lab that is full of highly accomplished and hardworking individuals. However, even a laboratory with such great workers, the success of the lab is still dependent on the organization and interactions between workers and technology, this is where the sociology of laboratory comes into play as a technique for understanding the dynamics and how the lab functions overall.

De-epithelialized Bladder Wall Transplantation: Epithelial In-Growth and Regeneration

Jay Modi
Sponsor: Eric A. Kurzrock, M.D.
Urology

Engineered bladder wall is needed for patients with bladder cancer. A cellularized graft made from autologous urothelium would not be safe. We sought to evaluate the histologic changes in a de-epithelialized graft and the host bladder after transplantation. De-epithelialized male bladder wall grafts were transplanted onto syngeneic female rat bladders after partial cystectomy. Urothelial morphology, vessel density, inflammation, stromal thickness, and uroplakin expression were evaluated 1, 3, 6 and 9 months after surgery. Cell gender was distinguished with fluorescent in situ hybridization and unique X and Y rat chromosome probes. The male graft urothelial morphology and uroplakin expression were similar to controls at all time-points. The donor bladder had decreased vessel density at early time-points, whereas the host had increased vascularity, which normalized in both by 6 months. FISH demonstrated early in-growth of host female urothelium and a small fraction of male urothelial cells. The current experiments demonstrate the feasibility of using an engineered bladder wall graft that does not contain urothelium. By nine months after transplantation, the graft appeared as normal bladder wall and was equally efficacious as full-thickness grafts previously evaluated. This small animal model demonstrates the potential of using engineered bladder tissue without epithelium for cancer patients.

A Philosophical Evaluation of The Citizens United v. Federal Elections Commission Case

Brian K. Moen
Sponsor: David Copp, Ph.D.
Philosophy

The Supreme Court decision in the Citizens United v. Federal Elections Commission case has major implications in how elections will run in the United states. The lift on corporate spending has been a contentious issue, since the Court made the decision in January, 2010. Corporations will no longer have a limit on how much money they can spend financing elections, and they will be able to fund them directly. The Court claims that it is upholding the First Amendment right to free speech. This article will examine briefs written by the Justices in order to analyze each position, and see which interpretations of the Constitution uphold each view. Then it will examine whether their reasoning seems sound and defensible in light of the value of democracy and the value of free speech, which in this case seem to be at odds. The analysis of these values will be based on philosophical principles which ground democracy.

Utilization of Cell-Deposited ECMs as Biomaterial Surface Coatings

Azad Mojadedi
Sponsor: Jonathan K. Leach, Ph.D.
Biomedical Engineering

Mesenchymal stem cells (MSCs) secrete an extracellular matrix (ECM) that can be retained following detergent-based decellularization, and we have previously demonstrated the ability of this ECM to modulate the attachment, proliferation, and osteogenic differentiation of secondary progenitor cell populations. While such residual ECM coatings are fairly easy to manufacture and test on 2D surfaces, mass transport issues limit the ability of cells to deposit ECM coatings throughout porous 3D material constructs commonly utilized in skeletal tissue engineering. We therefore hypothesized that ECM coatings produced in large quantity on tissue culture plastic (TCP) in 2D would retain their biological properties following removal from the TCP surface and application to a new surface, thus providing a method of coating more complex material structures with a homogenous layer of MSC-deposited ECM. Human MSCs were cultured on TCP plates for 2 weeks and decellularized with 0.5% Triton X-100. The residual ECM was then scraped from the surface and broken into smaller pieces via sonication. Presently, we have confirmed that we can coat 2D surfaces with known concentrations and in varying patterns using this ECM. We are currently examining the ability of these ECMs to modulate the attachment, proliferation, and osteogenic differentiation of naïve MSCs.

The U.S. Sugar Problem: Why Free Trade Cannot Compete with the Status Quo

Roxanna E. Moradi
Sponsor: Edward Dickinson, Ph.D.
History

This paper seeks to investigate why the U.S. has protected its sugar industry within the World Trade Organization. I argue that there are historical, international, political, and economic factors that have caused the U.S. Department of Agriculture and Foreign Agricultural Service to use price supports rather than free trade. In an age of free trade ideology and [illegible]rse with numerous trade agreements bei[illegible]ot[illegible]ec[illegible]s m[illegible]rtant to investigate and dis[illegible]ss[illegible]uch[illegible]. T[illegible] sugar program curren[illegible]y use[illegible]i[illegible]a[illegible]d (TRQs) and a price floor. Other nation[illegible]much more drastic programs including subsidies. This paper discusses why these barriers exist and advocates a plan for multilateral, global action to induce a freer sugar trade. Terms: Tariff Rate Quota (TRQ): allows a certain amount of imports with a specified tariff. If imports exceed quota, tariff rate drastically increases. Quota/Allotment: the highest number of sugar imports allowed to enter. Subsidy: a direct or indirect payment from a government to sugar producers.

Dance is Communication: I Speak with My Body

Melissa Muganzo
Sponsor: Dr. Halifu Osumare, Ph.D.
African American and African Studies

From the international Hip-Hop Phenomena's "The Jerk" and "The Dougie" to popular folk dance such as "Clogging" and "Polk," dance thrives from an aesthetic in which the body, as a physical instrument, is used to communicate text. While today's American social dance is infused with heavy influence from contemporary modern dance trends, its core stems from a combination of Eurocentric and Afrocentric movements, in which social practices from each have cultivated its technique. These styles have become social understandings that grew to use bodily movements as a form of cross-cultural cognitive communication. This research interrogates dance as a form of social communication and human interaction. It partakes in the analysis of dance as philosophic aesthetic connections through Afrocentric paradigms. This includes the deconstruction of academic bias against dance as bodily communication on mainstream American popular dance.

Effects of Biotechnology on Greenhouse Gases from Feedlot Cattle

Jacob M. Murphy
Sponsor: Frank Mitloehner, Ph.D.
Animal Science

The feedlot industry uses biotechnologies like antibiotics, growth hormones, and β_2-adrenergic agonists to increase the growth performance and well being of cattle. These products alter the diversity of microbes in the rumen and may affect nutrient retention and absorption rates, which may lead to reductions of harmful greenhouse gases (GHG). The present study investigated GHG_emissions of 160 Black Angus steers housed in totally enclosed cattle pen enclosures in groups of ten. Treatments applied were: (1) control (no biotechnology application, CON), (2) Rumensin and Tylosin (RUM), (3) Rumensin, Tylosin, and Revalor-s (IMP), and (4) Rumensin, Tylosin, Revalor-s, and Zilpaterol hydrochloride (BAA). Treatment groups were compared simultaneously using a 4 by 4 Latin square design. The INNOVA 1412 gas analyzer was used to measure N_2O and CO_2. Methane was measured using the TEI 55C analyzer. Emissions are reported in g^{-1} kg hot carcass weight $(HCW)^{-1}$ d. All measurements were analyzed using Proc Mixed in SAS. Treatment with IMP and BAA increased ($P<0.05$) average daily gain and final body weight. BAA vs. other treatments increased HCW ($P<0.05$) and reduced ($P<0.05$) CH_4 emissions. The present study will provide a better understanding of how antibiotics and growth enhancers used in beef cattle affect GHG emissions.

The Role of the Planar Cell Polarity Pathway in the Development of a Sexually Dimorphic Trait in the Fruit Fly *Drosophila melanogaster*

Alexa Mutti
Sponsor: Artyom Kopp, Ph.D.
Evolution and Ecology

Previous studies have shown that the canonical planar cell polarity (PCP) pathway is responsible for governing the coordination of cells in asymmetrical alignment during embryonic development, as seen in animal fur, fish scales, and bird feathers. In our research, we aim to determine if the PCP pathway is involved in the rotation of the sex comb, a configuration of modified male-specific bristles on the forelegs of the *Drosophila melanogaster* fruit flies, through a process of convergent extension during metamorphosis. Using the UAS-GAL4 and temperature-sensitive GAL80 system, we attempted to disrupt sex comb bristle alignment through both the ectopic expression of PCP proteins and their inhibition through RNA interference (RNAi). To determine the localization of PCP proteins in the region of the sex comb during development, we stained developing *Drosophila* pupal legs with antibodies against the proteins of interest, and used confocal microscopy to image the stained legs. We have so far shown that the disruption of the cadherin Flamingo, a protein in the PCP pathway, alters sex comb alignment, that it localizes asymmetrically within sex comb bristles and surrounding cells, and that this localization differs from that of other non male-specific bristles.

A Monte Carlo Computational Study of Cancer Cell Death

Arjun M. Nair
Sponsor: Subhadip Raychaudhuri, Ph.D.
Biomedical Engineering

Apoptosis involves complex interactions among numerous intracellular proteins that eventually results in cell death. However, apoptotic death of cells are tightly regulated by several families of anti-apoptotic proteins, such as Bcl-2 and IAP. Their complex non-linear interactions with other apoptotic proteins govern whether or not the cell really commits to self-destruction. However, when a cell becomes cancerous, it becomes nearly immune to the execution signals sent by its surroundings. This is because cancer cells over express anti-apoptotic proteins such as Bcl-2 and XIAP. Targeting these anti-apoptotic proteins seems to be a new possible avenue to combat cancer. To investigate this new possibility, we carried out kinetic Monte Carlo simulations of apoptosis. Monte Carlo simulations are stochastic simulations that individually map out the set of proteins involved in apoptosis and track the movement and reactions of each protein as the signal cascade progresses in the cell. We further carry out quantitative analysis of the data obtained from our Monte Carlo simulations that allows us to (i) measure important cell-to-cell variability in cancer cell death, and, (ii) provides insights into an effort to minimize such variability. Results of our computer simulations are synergistic to experimental studies done in our collaborator's lab.

Diet of Fruit Flies Determines the Bacteria in Their Intestines

Nancy-Jaime M. Napan
Sponsor: Artyom Kopp, Ph.D.
Evolution and Ecology

Fruit flies have incredibly diverse diets, and harbor many different types of bacteria in their digestive system. Because intestinal bacteria are most likely determined by the diet of the host, the manipulation of flies' diets should result in different bacterial communities. My hypothesis is that the diet of fruit flies has a direct effect on the biodiversity of bacteria within their intestines. To achieve this, flies were collected from different fruit piles and then dissected to acquire their gut contents. Bacteria present in their intestines were isolated. DNA from the bacteria was extracted and used as a template to amplify ribosomal 16S gene by the polymerase chain reaction. Sequence comparison analysis was then used to identify the bacteria. The community of bacteria found in flies that fed on grapes was composed of different species compared to that found in flies that fed on peaches. Through the identification of the bacteria found in the intestines of flies I was able to see that there is a correlation between the flies' diet and the bacteria they contain in their intestines, therefore supporting the hypothesis tested.

The Lived Experience of Obesity

Rajiv Narayan
Sponsor: Jon Rossini, Ph.D.
Theatre and Dance

The obesity epidemic looms large as an issue of public concern. Estimates show that obesity costs the country $270 billion (accounting for medical care, mortality, and loss of productivity). Other studies have pegged obesity rates at 34 percent of the adult population. However, the literature written to understand this issue has yet to account for the complexity of obesity. Many studies instead aim to show a "slice of the problem," and target a piece of the phenomenon. Other interpretations study the representation of obesity and focus on cultural signaling. In either case, studies have grown increasingly isolated from the complete, lived experience of the obese body. This paradigm is reflected in medical, pharmacological, and policy interventions, which often fail to account for the totality of obesity beyond the particular issue they are trying to solve. This research is an attempt to envision and portray the phenomenological life experience of an obese person through collecting research together from psychology, nutrition, biomechanics, economics, legal theory, and performance studies in a hypothetical ethnography, or a narrative. The study's conclusions encourage interventions to be designed with a holistic grasp of the issues faced by the obese body.

Merovingians and Carolingians: Were They that Different? The Misconception of the Early Frankish Kingdom

Tirumular C. Narayanan
Sponsor: Carlee Arnett, Ph.D.
German

My presentation will discuss the Merovingian and Carolingian dynasties of the Early Frankish Kingdom. It has long been conceived that the Merovingian and Carolingian eras were polar opposites. However, one must ask if these two dynasties were truly different. By looking in depth into their artwork, traditions and their actual political policy my research will shed some light on this matter. I also hope to prove that the "Do Nothing Kings" (Merovingian) were productive and that they actually set the foundations for the mighty Carolingian Empire. I also want to show that the reputation of the Carolingians was due to the actions of two men (Charles Martel and Charlemagne) not because of the alleged productivity of the family as a whole. In textbooks today (including Bachman's Medieval Culture used at UC Davis) teach that the Merovingians were useless and the Carolingians were the saviors. From my research I do not believe that this is true, but in fact these two eras complement each other in the creation of France and the Holy Roman Empire of the 11th century.

Japanese Case Markers and Language Learning: A Comparison of Public High School and Heritage Language School Learners

Andrea M. Nelson
Sponsor: Robert Bayley, Ph.D.
Linguistics

Proper usage of the topic/subject markers -wa and -ga often proves difficult for learners of Japanese. However, previous research reveals that native-like usage increases with language proficiency (Nakahama, 2009). This study aims to a) compare the usage of Japanese, with a focus on the particles -wa and -ga, by students learning Japanese in their last year of study at a public high school to students of high school age learning the language at a Saturday heritage language school and b) better understand the different factors that may affect the this usage and their implications for language learning contexts. Fifteen participants from a public high school, a Saturday language school, and two native speakers as control subjects will complete a variety of tasks, which will be examined for accuracy of -wa and -ga usage. Tasks include a survey about participants' language history and attitudes, a narrative retelling of a short film, and a fill-in-the-blank grammar test based on the same film. Overall, students from the language school, who have been exposed to Japanese since early childhood, are expected to perform at a higher level. However, the fill-in-the-blank test is expected to result in greater accuracy for both groups.

Investigating a New Nuclear Migration Pathway in *Caenorhabditis elegans*

Minh Ngo
Sponsor: Daniel A. Starr, Ph.D.
Molecular and Cellular Biology

Normal development requires organelles like the nucleus to be properly positioned in the cell. In humans, failure of nuclear migration can lead to defects like muscular dystrophy, mental retardation, and cancer. My project aims to elucidate the mechanisms of nuclear migration. In *C. elegans*, the *emu* enhancer pathway is required for nuclear migration, but only one gene in this pathway has been identified. Therefore, this study attempts to identify other genes involved in the *emu* pathway. I've been attempting to clone an *emu* allele by traditional genetic mapping and modern whole genome sequencing. Two-point mapping of the yc16 *emu* allele places it on Chromosome X. Whole genome sequencing an *emu* mutant strain provides a map of almost all putative molecular lesions present in its genome. I have identified over 30 putative mutations by analyzing whole-genome sequence data from the yc3, yc18, and yc20 *emu* alleles. I have designed over 100 primers to discount 13 false mutations by Sanger sequencing and to RNAi the genes that each true mutation affects. A knocked-down gene by RNAi that produces the *emu* phenotype is an *emu* gene. By the same techniques, I am working to identify the genes responsible for the yc16 *emu* allele.

Characterization of Root Uptake and Systemic Transport of *Salmonella enterica* SV Typhimurium into Melon Vines and Fruit

Donee M. Nguon-Pheng
Sponsor: Trevor V. Suslow, Ph.D.
Plant Sciences

Outbreaks and surveillance-based recalls due to *Salmonella enterica* in melons have suggested that contaminated irrigation water could be a risk in root uptake and internalization of *Salmonella* into plant tissues and melon fruits. This work aims to determine whether root uptake of *Salmonella* results in systemic transport to melon fruits. Melon vines were grown under greenhouse conditions (n=150) and inoculated with >8log CFU/ml of attenuated *S. Typhimurium*. After 24 hours of inoculation, presence of *Salmonella* in vines was determined after enrichment. Field inoculations included furrow-irrigation and injection of contaminated water in subsurface drip lines. Mature melons were harvested up to 48 days after inoculation (n=415). Melon surfaces were sterilized and the abscission zone core was analyzed for *Salmonella*. Quantification of *Salmonella* in bulk and rhizosphere soil was assessed. Systemic transport from roots to vine was infrequent under greenhouse conditions. Internalization of *Salmonella* was not detected in vines or fruits under field conditions for either contamination-exposure method. Transfer of furrow-inoculated *Salmonella* was neither detectable across the soil bed nor within the rhizosphere and roots of developing vines. Internalization of *Salmonella* from soil and vascular system to fruit is unlikely to occur from contamination of irrigation water even at very high concentrations.

A Yeast Two-Hybrid Screen to Identify UNC-84 Cytosolic and Nucleoplasmic Interacting Partners

Joe T. Nguyen
Sponsor: Daniel A. Starr, Ph.D.
Molecular and Cellular Biology

Mutations in inner nuclear membrane proteins have been linked to human diseases, such as muscular dystrophies and lissencephalies. However, the mechanism(s) by which they are localized and retained are largely unknown. Four signals in the cytosolic/nucleoplasmic domain of the inner nuclear membrane SUN protein, UNC-84, contribute to its localization and function at the inner nuclear membrane. Different proteins interact with UNC-84 for trafficking, in the cytoplasm, and for retention in the nucleus. I hypothesize that identification of UNC-84 binding partners will elucidate the mechanisms of both targeting and retention of UNC-84 at the inner nuclear membrane. To indentify interacting partners of UNC-84, I performed a yeast two-hybrid screen of the *C. elegans* cDNA library. The entire cytoplasmic/nucleoplasmic domain of UNC-84(1-510AA) was used as bait. Approximately $1.0x10^6$ clones were screened and 14 positive interacting partners were identified. Two candidates function in ER to Golgi transport, one functions in nuclear signaling, and another is a component of the nuclear lamina. Future work is aimed at mapping the protein-protein interactions between candidates and UNC-84 baits, as well as testing their *in vivo* function by RNAi. These studies will provide novel insight into trafficking proteins to the inner nuclear membrane.

Identification of Environmental Regulators of Volatile Production in Plants

Stephanie D. Nguyen
Sponsor: Katayoon Dehesh, Ph.D.
Plant Biology

As sessile organisms, plants have an extensive network of metabolic pathways to respond to abiotic and biotic stresses. *Hydroperoxide lyase* (*HPL*) pathway, a stress-inducible pathway named after the key enzyme, produces aldehydes which are precursors of green leaf volatiles. Important to the plant's ecological function, green leaf volatiles play a role in intra- and inter-plant interactions, tritrophic responses, and antimicrobial and insect defense. The objective of this project is to identify the nature of the stimuli that activate transcription of *HPL* in *Arabidopsis thaliana*. Towards this goal, a range of abiotic factors, such as a heat, cold, salt, and wound treatment, were individually applied to the plants expressing *HPL::LUC* construct, followed by measurements of *LUC* expression levels using a CCD camera. Among these stimuli, only cold and wound treatment led to activation of *HPL* promoter. Through this approach, we are able to examine a wider range of biotic and abiotic factors that differentiate between the stimuli that cause the plant to release green leaf volatiles and those that don't stimulate this pathway, and thereby gain a detailed understanding of the intricate environmental networks that regulate volatile production in plants.

Profiling of Lipids in Response to Hypertension Treatment-Aspirin and Plavix

Tran L. Nguyen
Sponsor: Oliver Fiehn, Ph.D.
Molecular and Cellular Biology

Aspirin and Plavix are two common drugs in treating and preventing hypertension. However, patients respond differently to drug treatment and prediction of metabolic effectiveness of these drugs is challenging. This project focuses on examining the difference in lipid compositions between the control (non-responder) and treated (responder) groups of Aspirin and Plavix, in addition to analysis of other parts of metabolism. Plasma samples taken from the participated patients were extracted using methyl-tert-buthyl ether (MTBE) and analyzed using robotic nanoelectrospray and tandem mass spectrometry. Data were processed through Genedata Refiner MS and lipids identified by the Fiehnlab LipidBLAST software. Data will be inspected by statistics to reveal distinction between the responder and non-responder groups, both by multivariate statistics graphs and by univariate analysis. The top fifteen lipid compositions that characterize each group will be identified. If the two treatment groups show insignificant distinction, we may conclude that lipids may not be involved in determining drug responses for this treatment. If two groups show significant difference in lipid compositions, the identified lipid compositions can be used for further study to increase the effectiveness in hypertension treatments.

Delivery of PGIP from Rootstocks for Pathogen Protection in Grafted Tomatoes

Mar Joseph B. Odias
Sponsor: Ann T. Powell, Ph.D.
Plant Sciences

Grafting of crop plants is an agricultural method that has been adopted to improve plant vigor, fruit yield, and quality. An anti-pathogen agent synthesized in rootstocks may provide protection against the damage caused by pathogens in the upper scion portions of grafted plants. The fungus, *Botrytis cinerea*, is a significant rot-causing pathogen that uses polygalacturonase (PG), a pectin hydrolyzing enzyme, to infect ripe fruit, and thus, results in substantial economic losses for California's tomato industry, that are partially ameliorated by the application of polluting and dangerous chemicals. This project aims to test whether grafting is an effective strategy to protect plants, particularly ripe fruits, against *B. cinerea*. We developed trans-grafted tomato plants by joining rootstocks transgenically expressing a pear polygalacturonase inhibiting protein (pPGIP) gene, with non-transgenic scions. Ripe fruits of trans-grafted and ungrafted plants were collected from greenhouses and inoculated with 10 µL containing 1000 *B. cinerea* conidia. We observed lesions daily for 3 days and will be documenting the pPGIP protein translocation from the rootstock to the scion and fruit. Our preliminary results showed that disease severity was significantly reduced in ripe tomato fruits from trans-grafted plants in comparison to fruits from ungrafted plants that did not express pPGIP.

Test of Edaphic Specialization in *Navarretia jepsonii*

Rachael L. Olliff
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Environmental Science and Policy

Serpentine endemics, defined as plants growing on serpentine soil at least 85% of the time, have been hypothesized to be restricted to serpentine because they are outcompeted in more fertile soils, and possess adaptations that allow them to survive where other plants cannot. While serpentine endemics do possess such adaptations, in most cases they have been found to be more successful in non-serpentine soils when unexposed to competition. Previous research suggests that *Navarretia jepsonii* is a possible exception to this generality. To determine whether this exception holds, we set up experiment sites on both serpentine and non-serpentine soils throughout the UC Davis McLaughlin Reserve to test the growth of *N.jepsonii*. It was grown in conjunction with the control species Navarretia *pubescens*, a generalist species of the same genus. Early results show greater seedling emergence for *N.jepsonii* on serpentine soils, but greater total biomass per plant on non-serpentine soils. Seed production data is currently being analyzed. If an adaptation in *N.jepsonii* is detected, it could be due to an advanced mechanism for cation uptake, as serpentine soils have high concentrations of magnesium and low concentrations of calcium. Results could lead to a valuable understanding of serpentine plant ecology.

Vitamins A, C, and E and Autism Spectrum Disorder

Crystal Orozco
Sponsor: Rebecca J. Schmidt, Ph.D.
Public Health Sciences

Autistic disorder is a neurodevelopmental disorder characterized by impairments in social interaction, abnormalities in verbal, and nonverbal communication, restricted, stereotyped interests and behaviors. Previous studies suggest children with autism spectrum disorders (ASD) have higher levels of oxidative stress. Antioxidant nutrients retinol, ascorbic acid, and tocopherol (vitamins A, C, and E) help reduce levels of oxidative stress. Few studies have examined maternal vitamins A, C, and E as risk/protective factors for autism. Our objective is to determine whether supplemental vitamins A, C, and E during the pre- and perinatal period are associated with risk for ASDs. Northern Californian families of children were enrolled into the CHARGE (Childhood Autism Risks from Genetics and Environment) population-based case-control study. Diagnoses of ASD, DD, and typically development (TD) were confirmed at UC Davis M.I.N.D. Institute using standardized clinical assessments. Information was collected through parental interviews from 2003-2009 on the frequency and brands of cereals, prenatal vitamins, multivitamins, and nutrient-specific vitamins consumed 3 months before and throughout pregnancy and during breastfeeding. From this information, we will quantify an average daily amount of vitamins A, C, and E for each mother and compare maternal intake of each between cases and controls for each month.

Optimization of a Low Cost Direct Route to the Thermoelectric Material, $Yb_{14}MnSb_{11}$

Francisco A. Ortega
Sponsor: Susan M. Kauzlarich, Ph.D.
Chemistry

$Yb_{14}MnSb_{11}$ is thermoelectric material with a figure of merit (zT) of 1 at 1200K, making it a good material for high temperature applications. In the current published synthesis, molten Sn is used as a solvent to react the ytterbium, manganese, and antimony and slow cooled to form crystals in the desired phase. The reaction is then centrifuged immediately when taken out of the furnace to extract the crystals. Though the large single crystals obtained by Sn flux synthesis are preferred for certain analytical techniques, the process is not feasible for mass production and leaves residual tin on the crystals which can affect thermoelectric properties. Through a synthesis using mechanical alloying and spark plasma sintering, the problems of residual tin can be avoided and the synthesis can be better optimized for mass production. By studying the effects of ball-milling time and the ball to powder mass ratio, we will determine the optimal conditions to synthesize $Yb_{14}MnSb_{11}$ through mechanical alloying and spark plasma sintering.

Identification and Characterization of Early Development Regulators in *Myxococcus xanthus*

Nikolay M. Ostrovskiy
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Microbiology

Our goal is to identify early regulatory components of the developmental pathway of *Myxococcus xanthus*. *M. xanthus* is a Gram-negative social soil bacterium that undergoes a multicellular developmental program in response to nutrient limitations. This program leads to a differentiation event, where the remaining cells undergo morphological and physiological changes to form environmentally resistant myxospores in 24 to 48 hours. We identified several regulatory genes required for controlling development by reverse genetics based on developmental DNA microarray data and mutational analysis. We identified twelve receiver-domain regulatory genes whose expression is activated during nutrient limitation based on DNA microarrays. We constructed 15 in-frame deletions using PCR. Deletions were confirmed by PCR and the resulting mutants were characterized for a battery of vegetative and developmental phenotypes including fruiting body formation, sporulation efficiency, motility and developmental gene expression. Of the initial candidates, we have completed analyses on four genes. Mutants deleted for MXAN0710, 5889, 5656 and 3711 display a delay in the formation of fruiting bodies in contrast with the wild type, demonstrating their role in development.

The Energetic Impact of Calorie Restriction in p66Shc(-/-) mice

Ashley Ott
Sponsor: Jon J. Ramsey, Ph.D.
Molecular Biosciences

Deletion of p66Shc has been reported to retard aging and protect against obesity and diabetes. Calorie restriction (CR) has been demonstrated to have a similar impact on aging and age related diseases. An alteration in energy metabolism may represent a fundamental mechanism by which both p66Shc and CR impact the aging process. Thus, we are investigating the impact of CR on whole body energy metabolism in p66Shc(-/-) mice compared to that of wild-type (WT) controls. Indirect respiration calorimetry will be used to determine the impact of a 3 day period of 40% CR on energy expenditure (EE) and substrate utilization (RQ) in 18mo p66Shc (-/-) and WT mice. In addition, body mass, organ mass, and body composition data will be collected to assess the impact of CR in p66Shc(-/-) mice. Preliminary data demonstrates that p66Shc may have a major impact on whole body EE and RQ. Further investigation will assess the impact of long term CR on energy metabolism in p66Shc(-/-) mice.

Waiting for a Bed: Emergency Department (ED) Patient Preferences for Boarding When the Hospital is Full

Gal Ozery
Sponsor: John Richards, M.D.
Emergency Medicine

Admitted patients are frequently boarded in ED hallways when a hospital has no available inpatient beds. This is a major cause of ED overcrowding and compromises patient care. One solution is to board admitted patients in an inpatient unit hallway rather than the ED hallway, which is crowded, noisy, lacks privacy, and has limited nursing care. We conducted a survey study to query admitted patients in the ED at UC Davis Medical Center about their personal preferences regarding boarding: 99 total surveys were completed during October 2010; 42 (42%) patients preferred to be boarded in an inpatient hallway, 33 (33%) preferred to remain in the ED, and 24 (24%) had no preference. National ED overcrowding score (NEDOCS, range 0 - 200) was recorded during each survey. Mean (± SD) NEDOCS was 135.8 ± 45.5 for patients preferring inpatient boarding, 111.7 ± 39 for ED boarding, and 119.3 ± 43.1 without preference. Preference for inpatient boarding was associated with a higher NEDOCS ($P = 0.05$, ANOVA). Patient satisfaction was also queried on a 1 - 5 Likert scale. Correlation between higher satisfaction with their overall care in the ED and lower NEDOCS was observed but did not reach statistical significance (Spearman Rank Correlation $\rho = -0.14$, $P = 0.08$). Conclusion: Patients prefer inpatient over ED hallway boarding when the hospital is at or above capacity.

Developing Parameters for the Measurement of Prepulse Inhibition in Prairie Voles

Julia F. Palmer
Sponsor: Karen Bales, Ph.D.
Psychology

Prepulse inhibition is a phenomenon, often measured in rodent models of schizophrenia, in which a weaker sound that is played before a startling stimulus reduces the startle response. This behavioral measure is well established with common laboratory rodents like mice and rats but has not been used extensively with other rodent models. The prairie vole, *Microtus ochrogaster*, is of interest to researchers as a laboratory model because its monogamous social system is more similar to that of humans than other lab rodents. Initial studies in prairie voles did not show a decrease in startle response in the presence of a prepulse. In this experiment we varied parameters such as length of the prepulse, interval between the prepulse and the startle, and the magnitude of the prepulse in order to observe whether these changes would decrease the startle response in prairie voles. We tested both males and females at three distinct life stages: weanlings, adults, and breeding adults in order to observe effects of sex and age. We hope to observe a decrease in the startle response as a result of one of these conditions and thereby validate the use of the startle box as a behavioral measure in prairie voles.

AZC Tolerance of *Saccharomyces cerevisiae* Strains

Paul J. Park
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Food Science and Technology

Saccharomyces cerevisiae is a yeast species that has been used for thousands of years by people for winemaking, brewing, and baking. *S.cerevisiae* utilizes the amino acid proline as an osmoprotectant under stressful conditions and stress resistance in the yeast can be correlated with proline levels. In this study, various strains of *S.cerevisiae* were put under stress conditions by growing them on agar with 0.1mg/ml and 0.3mg/ml L-Azetidine-2-carboxylicacid; AZC for short. AZC is toxic to *S.cerevisiae* in that it substitutes proline in ribosomal protein production and causes misfolding. Certain strains of *S.cerevisiae* have a gene called MPR1 makes an enzyme acetyltransferase that detoxifies AZC by converting it into N-acetyl AZC. Tolerance to AZC is therefore also correlated to overall stress resistance. Correlation between strain origin and resistance is then analyzsed. Wine yeasts are generally more tolerant towards ethanol and other stresses. These are also the strains that are generally tolerant of AZC. Also differences in amino acid sequences of the MPR1 and MPR2 genes may also correlate with tolerance levels of AZC. Strains that grow best under the AZC medium are chosen and PCR is done in order to replicate the MPR1 gene region.

Otubain1 Stabilizes Nrdp1 and ErbB3 Independent of it Catalytic Activity: Implications for ErbB3 Positive Breast Cancer

Devan D. Patel
Sponsor: Colleen Sweeney Sweeney, Ph.D.
Biochemistry and Molecular Medicine

Ubiquitination is an integral cellular process that modifies proteins by conjugating ubiquitin (Ub), a small polypeptide, through a three step enzymatic reaction. Ub is activated by an E1 enzyme, transferred to an E2 enzyme, and then transferred to the substrate by an E3 ubiquitin ligase. A major role of ubiquitination is to mark proteins for degradation. Classically, deubiquitinating enzymes (DUBs) are known to catalyze the reversal of this process by removing Ub, stabilizing the substrate. However, Otubain (Otb1), a DUB, has recently been shown to inhibit function of the E3 by binding to the E2, preventing the Ub transfer. This property of Otb1 is independent of its catalytic activity. We have found that Otb1 can stabilize Nrdp1, an E3 ligase, and its substrate ErbB3. Nrdp1 and ErbB3 are known to play critical roles in the carcinogenesis of many solid tumors, including breast cancer. In addition, UbcH5a, an E2 known to interact with Otb1, is shown to regulate expression of Nrdp1 and ErbB3. Otb1's regulation of Nrdp1 and ErbB3 may prove to be a novel therapeutic target in breast cancer, particularly ErbB3 positive disease.

Induction of a Novel B Cell Differentiation Pathway via Direct CD86-Mediated Stimulation of Memory B Cells

Eric Payne
Sponsor: Nicole Baumgarth, Ph.D.
School of Veterinary Medicine

CD86 is a cell-signaling and surface molecule expressed on B cells, whose effects on B cells are incompletely understood. We previously demonstrated that CD86 stimulation of immunoglobulin isotype-switched B cells using CD86-specific antibodies induces rapid IgG production, which we confirm here. However, whether this stimulation results in terminal B cell differentiation to the plasma cell stage, characterized by expression of the cell-surface marker CD138 and the transcription factor Blimp-1, has not been assessed before. Therefore, to characterize B cell differentiation induced by CD86 stimulation, we used multicolor flow cytometric analysis to assess the presence of the cell-surface marker CD138, among others, and the expression of yellow fluorescent protein, which was under the control of the Blimp-1 promoter and so simultaneously expressed with Blimp-1. Stimulation of naïve B cells with a mix of cytokines and stimulators known to induce terminal B cell differentiation served as a positive control. Our studies demonstrate that CD86 stimulation induces expression of the plasma cell marker CD138 on a subset of the cells, but all cells lacked high expression of Blimp-1. We conclude that CD86 signaling induces a distinct stage of non-terminal B cell differentiation, characterized by expression of CD138 in the absence of Blimp-1.

The Baroreflex: Is It Out of Control in Hibernation?

Lance R. Peery
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Pharmacology

Blood pressure (BP) and heart rate (HR) are maintained at low levels during hibernation and increase before a rise in body temperature during arousal from hibernation. However, the baroreflex function during arousal from hibernation is unknown. I hypothesize that baroreflex sensitivity (BRS) is reduced during hibernation and there is a significant overshoot of BP immediately after arousal while BRS returns to euthermic levels. Twelve days after implanting a telemetry transmitter to continuously record BP and HR, three Syrian hamsters were housed in a cold room at 6±1°C on an 8:16 light-dark cycle to induce hibernation. I calculated BRS during hibernation bouts by determining the slope of sequences of changing HR following inverse changes in BP. BRS was found to be greatly reduced during hibernation (from -13.90±5.39 to -0.09±0.08 bpm/mmHg), and just after arousal, there was an overshoot in BP as BRS returned to euthermic values (21.20±19.93 mmHg above pre-hibernation values). Data support my hypothesis and suggest that during the overshoot in BP, BRS increases to euthermic levels and stabilizes BP, indicating effective regulatory control.

Effect of Fiber on Greenhouse Gas Emissions from Stored Manure

Kristen M. Perano
Sponsor: Ermias Kebreab, Ph.D.
Animal Science

Lagoons from livestock operations emit greenhouse gases (GHG), particularly methane (CH_4) and carbon dioxide (CO_2). The purpose of the study was to explore the effects of fiber content in the manure on the amount of GHG emitted from the anaerobic digestion of pig manure. Pigs were fed 3 different diets (NDF = 12%, 16%, and 20), and manure from the treatments was collected and stored in anaerobic digesters in triplicate for 139 days. The CH_4 and CO_2 emitted were collected for each digester daily. A first order model was derived describing the concentration of volatile solids with time, and the Arrhenius relationship was used to model the rate of formation of CH_4. The ANOVA analysis of the first-order rate constant and the log of the Arrhenius constant showed no difference between the 3 treatments (P = 0.63). Cumulative emissions over 139 days showed a trend towards higher GHG production as NDF content increases, but it was not statistically significant (P = 0.55). Part of the reason for lack of detecting a difference between treatments was the high variation of observed emission values within a treatment. Alternatively, GHG emissions from stored manure may not depend on NDF levels.

A Murder Mystery Solved: How Strontium Isotope Analysis can be used to Solve Questions on Mobility in Central California

Christopher R. Peske
Sponsor: Jelmer W. Eerkens, Ph.D.
Anthropology

Tracing the movement of individuals over the landscape, for example, through marriage or migration from one community to another, is of long-standing interest to archaeologists. Previous studies of migration have often relied on the spread of iconography or particular styles of artifact production. One problem with this approach is that people can copy styles without actually moving. Recent advances in stable isotope analyses are giving archaeologists new means to approach this subject. Stable isotope ratios can act as geographic tracers on individuals, indicating where they were at a particular point in time. This study focuses on strontium, carbon and nitrogen isotopes as a means to track ancient peoples across Central California. Three individuals from a late prehistoric (1000 BP -Contact) archaeological site between Davis and Sacramento were included in this study. First molars (representing growth during early childhood), third molars (representing growth during teenage years), and adult bone(representing growth over the final 10-15 years of life) were examined to track individuals across the landscape at different points in their lives. Because the three individuals appear to have been murdered, we are especially interested in whether they are local to Yolo County or were outsiders passing through.

Deletion of p66 Does not Result in Alterations in Skeletal Muscle Mitochondrial Function

Don P. Pham
Sponsor: Keith Baar, Ph.D.
Neurobiology, Physiology and Behavior

Since the Shc locus was identified as playing a role in longevity, tremendous amounts of research have been conducted on the three proteins that are encoded within this region. One of these is a 66kDa protein (p66shc) that is localized to the mitochondrial matrix, where it oxidizes Cytochrome-C and is important for maintaining the proton gradient that drives ATP production. The purpose of our study was to determine whether the deletion of p66 would induce metabolic changes within skeletal muscle. To test this hypothesis, the metabolic profile of representative oxidative and glycolytic muscles (the soleous and tibialis anterior, respectively) of 3 and 12 month-old wildtype and knockout mice was studied. Using antibodies to measure 13 oxidative and 6 glycolytic proteins from the different muscles and ages, we found that phosphofructokinase, a key glycolytic enzyme, increases in the oxidative muscle of p66 knockout mice. We found no statistical difference in any of the other proteins at either age in these mice. As a result, we do not believe that the deletion of p66 results in alterations in skeletal muscle mitochondrial function nor do we think that alterations in muscle metabolism contribute to the longevity seen in p66 knockout mice.

Software for Exact Integration of Polynomials Over Polyhedra

Gregory Pinto
Sponsor: Jesus DeLoera, Ph.D.
Mathematics

We explore the fast computation of exact integrals of polynomial functions over domains that are decomposable into convex polyhedra. Furthermore, we present practical implementations and extensions of two different algorithms presented in previous work. The triangulation algorithm is optimized for integrating a full-dimensional simplex and is applied to a general convex polytope by triangulating the given polytope into a finite collection of simplices, then integrating over each simplex individually. The other algorithm, due to Lawrence et al., first triangulates a polytope's tangent cones instead of triangulating the entire polytope as in the former algorithm, then integrates over each simple cone individually. Our experiments reveal that these two algorithms are complementary: simple polytopes integrate faster using the Lawrence algorithm, while simplicial polytopes integrate faster using the Triangulation algorithm. In addition, we describe the software implementation tools while providing benchmark computations. In the special case of finding volumes of polyhedra, we also compare the benefits of exact rational computation to leading floating-point numerical methods and current software tools.

Understanding Extremism: Casualties and Public Attitudes in the Al-Aqsa Intifada

Karina Piser
Sponsor: Zeev Maoz, Ph.D.
Political Science

The second Palestinian *intifada*, or "uprising," has become increasingly violent since its outbreak in September 2000. Israeli border security policy has, in turn, become more hawkish, emboldening the Palestinian population and fueling radical political positions. Tight checkpoints have limited movement within the Palestinian territories, causing political and social fragmentation. The distribution of Israeli violence since September 2000 is highly uneven, which points to a lack of universality in the Palestinian *intifada* experience. What is the relationship between casualties and support for armed resistance as a central tool in achieving the Palestinian national goal? In order to better understand the underlying causes of violence, I seek to explain variation in support for armed attacks against Israeli civilians since 2000 across different Palestinian electoral districts through cumulative and marginal measurements of *intifada* casualties. A cross-sectional time series regression will test the hypothesis that districts with higher fatalities are more likely to support violent resistance strategies. This question helps to explain surges in violence, and, when viewed in light of Hamas' 2006 victory, sheds light on attitudes towards extremist political parties.

God is Love, God is Food: The Devotional Eating Habits of Female Mystics of the Low Countries

Catrina G. Porter
Sponsor: Carlee Arnett, Ph.D.
German

The mystics, Hildegard of Bingen, Mechtild of Magdeburg and Mechtild of Hackeborn, associate the intake of food with extreme devotion to Christ. This manifests itself in the denial of food, except the Eucharist, in order to cause visions and feel bodily closeness to Christ. This practice was encouraged by priests and lauded as a special relationship to Christ. The practice was also constrained by priests in order to stop the women from becoming too powerful. This poster examines this duality by analyzing these women's writing in letters and records of their visions to detail their practices. The psychological and physical reasons behind their self-denial will also be examined. When receiving the host, these female mystics experienced an exchange of bodily fluids with Christ that enhanced their religious experience and otherworldly visions. Furthermore, their femininity was bolstered by their belief that they were suckling or being suckled by Christ. The denial of food causes a transfer of the pleasures of taste and texture to the body of Christ. The issue of women's self denial of food to represent physical love and nurturing in the guise of religious devotion has yet to be examined.

The Abundance of the Endangered Salt Marsh Harvest Mouse in the Diet of Barn Owls in the San Pablo Bay Wetlands

Katherine W. Powelson
Sponsor: Deborah L. Elliot-Fisk, Ph.D.
Wildlife, Fish and Conservation Biology

The San Pablo Bay has the most intact salt marsh systems in the San Francisco Bay estuary and is home to many federally listed endangered species, including the endemic salt marsh harvest mouse (*Reithrodontomys raviventris*). Barn owls (*Tyto alba*) are known to forage in salt marshes if roosting sites are available in nearby trees or human structures. We found an occupied barn owl roost in a hunting blind centrally located in the salt marsh. Using the known foraging range of the barn owl, we established that 87% of the owls foraging range was in salt marsh. We identified the small mammal remains from 143 owl pellets found under the roost. We found that salt marsh harvest mice make up a significant proportion of the barn owl's diet. This may have significant implications for the management of the endangered mouse if similar predation rates are found elsewhere in this salt marsh ecosystem.

Genetic Screen to Identify Mechanisms Through Which Arabidopsis Mutants Compensate for Lack of Xyloglucan in Plant Cell Wall

Laura N. Putnam
Sponsor: Georgia Drakakaki, Ph.D.
Plant Sciences

Plant cell walls are dynamic structures that play a pivotal role in growth and development, maintenance of cell integrity, and protection against pathogens. They are primarily composed of structural carbohydrates, which can be broken down into sugars that provide energy directly (in food) or indirectly (by fermentation to produce ethanol). This project focuses on the identification of mutations which interfere with the endomembrane trafficking mechanisms that regulate cell wall deposition. This poster presents research carried out on the *Arabidopsis thaliana xxt1/xxt2* mutant, which lacks xyloglucan in its cell wall and displays a strong root hair phenotype. An *xxt1/xxt2* suppressor screen was performed and selected mutants will be presented. Further analysis of selected M3 suppressor mutants was done to identify mechanisms through which the mutants compensate for the lack of xyloglucan in the cell wall. Confocal microscopy was used to understand the endomembrane trafficking mechanisms involved in these processes.

Saving Some Green: An Analysis of Federally Endorsed Woody Biomass Utilization Programs in the United States

William Quinn
Sponsor: Larry Berman, Ph.D.
Political Science

With the increasing pressures of climate change affecting U.S. national policy and federal resource management, further analysis of federal programs that aim to reduce the nation's net carbon dioxide emissions is necessary. This paper investigates which factors contribute to the initiation and continuation of woody biomass utilization (WBU) programs' formed in coordination with the U.S. Forest Service. Due to the relatively new emergence of this land management technique, from the standpoint of mitigating climate change, its potential is uncertain. Thinning of national forests is nothing new for land managers, and the proper levels of thinning shall remain debatable. However, with the addition of a new factor, biomass utilization, land managers should reassess their best land management practices. With this issue in mind, this paper discusses a range of factors affecting biomass utilization programs and analyzes two case studies in the western U.S. Through the integration of existing data, reports, studies, and dialogues, this paper concludes that the most significant factors affecting WBU program adoption and growth are community support, ecological conditions, infrastructure, and financial incentive programs. Furthermore, this paper recommends additional research into federally financed incentive programs that help to establish low-carbon management practices like WBU.

Miguel Angel Asturias and the Blending of Identities and Cultures in a Globalized "Guatemala"

William J. Ramirez
Sponsor: Linda Egan, Ph.D.
Spanish

Through various interviews with identified "guatemalans" in the US and Guatemala, I look for traces of Noble Peace Prize Laureate Miguel Angel Asturias's attempt to blend and bring together a divided Guatemalan nation in today's globalized era. Which is to say, where does Asturias's literature fit in as an important cultural and identity component for Guatemalans today? As the world grows more interconnected, commercially, culturally, technologically, etc. and the youth are exposed to many more different kinds of cultures, music, art, languages, films, etc. the question arises; what exactly is "Guatemala" today and where is it located? How does it differ from Asturias's Guatemala? Is his attempt at uniting a divided Guatemalan society still valid? Do people still read him? Which is to say, is he still alive (figuratively) amongst the Guatemalan people? And if he is, or he isn't, how effective, how important do people, particularly the youth, consider his unifying intentions to be in Guatemala today?

The Effects of Chemical Compounds on 26S Proteasome Activity

Shravan Rao
Sponsor: Aldrin Gomes, Ph.D.
Neurobiology, Physiology and Behavior

The 26S proteasome is a multi-catalytic enzyme responsible for the majority of degradation of unnecessary or misfolded proteins in eukaryotic cells. Studies have shown that the inhibition of the 26S proteasome has been shown to have anti-tumor and anti-cancer effects. Proteasome inhibitors have been shown to block cell proliferation and induce apoptosis over time. Proteasome inhibitors are also promising cancer therapy drugs. The two chemical compounds used in this study are Alpha tocopheryl succinate and Phenidone. Both of these compounds have been shown to have various anti-tumor and anti-cancer properties. Alpha tocopheryl succinate has been shown to be the most effective form of vitamin E to inhibit proliferation and apoptosis of cancer cells when compared to other forms of vitamin E. Phenidone is a lipooxygenase and cylooxygenase inhibitor and has been shown to cause an effective delay in tumor growth in mice. In this study, the effect of these compounds on proteasome activity was tested on cultured monkey kidney cells (CV-1) and mouse myoblast cells (C2C12). Addition of phenidone to CV1 cells was found to decrease proteasome activity suggesting that most anti-cancer compounds may be acting through inhibition of the proteasome.

Exploring the Modernist Theme of Alienation Within the Postmodernist Literature of Haruki Murakami

Lindsay E. Ream
Sponsor: Christopher F. Loar, Ph.D.
English

Haruki Murakami began his literary career after developing an intense interest in 20th century American fiction, the influences of which define his work. In my research, I examine the significance of the modernist themes of alienation and isolation portrayed in Murakami's literature, and how these themes are presented using postmodernist techniques such as time fragmentation, black humor and surreality. One recurring relationship Murakami seeks to define by the isolation it imparts is the romantic relationship, as Murakami's protagonists often experience a deep, lonely and seemingly insurmountable disconnect with their romantic interests. My project explores the ailment to which Murakami's modernist isolation was a symptom, why he felt the best way to present these issues was through such deliberately anti-modernist literary frameworks, and how these themes function within the context of romantic triangles. I will answer these questions through a close analysis of his novels *Norwegian Wood*, *Sputnik Sweetheart*, and *South of the Border*, *West of the Sun*, as well as by placing at him in the scope of Japanese literature. I hope to help my audience understand how these themes transcend literary periods, persisting as humans continue to question how they fit into an increasingly disconnected world.

Assessing the Nature and Composition of TMJ Fibrocartilage in Relation to its Mechanical Properties

Andrew J. Reimer
Sponsor: Kyriacos A. Athanasiou, Ph.D.
Biomedical Engineering

The temporomandibular joint (TMJ) disc is a fibrocartilaginous tissue located in the jaw joint. It is important in mastication and speech, and unfortunately enough, develops problems in many people. Tissue engineering is a blossoming research field with enormous potential to replace damaged tissues, including the TMJ disc. This particular project researches the mechanical properties of the TMJ disc, with the goal of creating design parameters for tissue engineering. Studies show that hyaline articular cartilage receives much of its mechanical properties from a group of polysaccharides called glycosaminoglycans (GAGs). While the TMJ disc contains GAGs, the overall quantity is much lower than hyaline cartilage, and it is unknown whether they play a significant role in the mechanics of the tissue. Based on a preliminary study by Dr. Kerem Kalpakci it appears that the TMJ disc's compressive properties may rely more heavily upon collagen content than GAGs. With this hypothesis in mind, this study will perform a treatment on porcine TMJ discs to deplete the tissue's GAGs and then mechanically test the samples.

Sex Differences in the Toxicokinetics of Naphthalene After Acute and Repeated Exposure to Explain Susceptibility of Female Mice to Naphthalene

Sonia D. Revello
Sponsor: Alan R. Buckpitt, Ph.D.
Molecular Biosciences

Naphthalene is a volatile polycyclic aromatic hydrocarbon to which humans are exposed from natural and anthropogenic sources. Van Winkle et al. noted a sex related difference in the extent and severity of NA-induced Clara cell injury. We quantified blood levels of naphthalene in mice exposed to 200 mg/kg body NA to assess whether gender differences are due to increased quantities of NA circulating in the blood and reaching target tissue in female than male mice. Higher blood levels of NA, likely due to lower first pass metabolism in the liver (a non-target tissue), may result in higher lung toxicity in female mice. A standard curve was constructed with 100µl of 0.2, 2, 20, 200 and 400 ng/ml varying concentrations of naphthalene and D_8naphthalene. Blood samples were collected via tail vein nick over a 24-hour period from female and male mice after a 200 mg/kg i.p. dose of NA. GC/MS analysis and calculation of area under the plasma concentration time curves for unchanged naphthalene showed circulating levels were much higher in females than in males. We conclude that the sex differences in susceptibility to naphthalene may be related to the levels of parent compound reaching the target tissue.

The Effects of Repeated Questioning on a Child's Ability to Give an Accurate and Consistent Testimony in a Legal Setting

Lauren Rice
Sponsor: Katherine Gibbs, Ph.D.
Psychology

For decades, researchers in the field of psychology have been trying to figure out whether or not children make reliable eyewitnesses. In addition, they have attempted to understand the effects an interviewer has on a child, including suggestibility and repeated questioning. This is of huge importance in the legal system because a child's false account could potentially convict an innocent person. The idea of repeated questioning generally comes with a negative connotation due to the belief that children will change their response to please the interviewer. However, more recent research has shown an alternative view. Some studies show that repeated questioning can actually have a positive effect on a child's ability to recall events consistently and accurately. The majority of these findings are dependent on the child's racial, socio-economical, and abusive history as well as their age. While a definitive answer may never be reached, the following paper takes an in depth view of both sides of the argument.

What Makes a Community Successful? Redefining Neighborhood Success to Include Use

Bridgitte C. Rivers
Sponsor: Frank W. Hirtz, Ph.D.
Human and Community Development

Neighborhoods are often viewed as succeeding or failing based on a narrow set of measurements which more often than not reflect only fiscal success. *If* a neighborhood fulfills the social needs of its residents is rarely considered outside the economic value such services add to property values. Starting with Logan & Molotch's argument for using "Use Value", not just "Exchange Value" to measure a neighborhood's success, I am conducting research on four Sacramento neighborhoods to determine which metric (use or exchange) most accurately portrays a community's success. My research will address the most common indicators used, if community development practitioners believe these are the indicators best suited to evaluate community success, what new indicators can or should be used, as well what preconceived notions of community success must be addressed to facilitate accurate measurement. Along with text analysis from journal articles, various scholastic works on the subject, and governmental/municipal statistics, I will conduct qualitative interviews with community leaders, as well as a "use" survey of neighborhood residents. I believe my research will lead me to the conclusion that a more nuanced method of measuring neighborhood success is required in order to facilitate meaningful economic and social policy.

Connect the Unexpected: Explaining the Exception to the Rule in Educational Attainment

Christina Robinson
Sponsor: Stephanie Mudge, Ph.D.
Sociology

Research about impacts of educational inequality on status attainment has demonstrated a positive correlation between a high level of educational attainment and high occupational prestige. Because educational attainment is the strongest predictor of occupational attainment, I am exploring educational attainment rather than occupational attainment. Research has generally focused on factors that *prevent* individuals from achieving a high educational (and thus occupational) status. However, research has often failed to empirically question what factors *enable* individuals to achieve a high educational status, specifically failing to investigate factors common to those individuals who attain high educational status despite lacking the demographic and background factors that generally predict high educational attainment. Therefore, we have a limited understanding of why those who are not expected to attain a high educational status-based on demographic and background information-do so. By analyzing the Longitudinal Study of Generations of respondents in California from age 15, spanning from 1971-2000 and over four generations, I intend to investigate whether there are consistent patterns among those individuals who "unexpectedly" attain a high educational status. I expect to find that levels of familial support, neighborhood income, and the gender of respondents will commonly influence exceptions to the trend.

California Ground Squirrel (*Spermophilus beecheyi*) Tail Flagging in Response to Human and Dog Stimuli or Looking at Anti-predator Tail Flagging

Anna D. Rogatkin
Sponsor: Lynette A. Hart, Ph.D.
Population, Health and Reproduction

An area of interest to researchers is anti-predator behavior which includes vocal and physical signals performed by a prey animal in response to a predator stimulus. In the case of California ground squirrels (*Spermophilus beecheyi*) the detection of a predator like a snake or coyote can be met with a variety of anti-predator responses including tail flagging to squirrels in the area or to the predator or both. Detailed studies of tail flagging behavior have shown a lot of variation and not very consistent patterns. In addition most of the research has focused on tail flagging as a response to the presence of a rattle snake or a gopher snake. The goal of this research project is to take a different approach toward tail flagging quantification and to look at mammalian threats, specifically human and dog stimuli. I expect to see prolonged tail flagging in lactating females because they have an interest in protecting their young and juveniles because they may be less discriminant in anti-predator behavior. Next to testing the hypothesis my hope is to prompt further thought on how tail flagging is analyzed in current research.

Personality Trait Generation Based on Knowledge of Past Behavior

Holly M. Rus
Sponsor: Kristin H. Lagattuta, Ph.D.
Psychology

Research has shown significant developmental changes in how children reason. Compared to older children and adults, 4- to 5-year-olds seldom use trait labels to describe people, they view negative behaviors as less enduring over time, and they view negative actions as less diagnostic of a person's character (Heyman & Giles, 2004; Ybarra, 2002). The current study investigates the spontaneous generation of trait labels in children's *explanations*. Potential for greater understanding of children's thinking and development lies in studying such explanations (Wellman, 2011). Four- to 10-year-olds and adults (N = 120) responded to scenarios featuring a child protagonist who experiences negative (N) and/or positive (P) past events caused by a specific human or animal perpetrator (4 trial types: NN, PP, NP, PN). Participants predicted and explained the focal characters' thoughts and emotions upon later encountering that same perpetrator. Explanations were coded for attributions of positive and negative traits (e.g., "Because he is a mean kid"). Several hypotheses were tested: (1) trait attributions will increase with age; (2) 4- to 5-year-olds will use more positive than negative trait labels, whereas older children and adults will exhibit the opposite pattern; and (3) use of trait labels will vary by trial type.

History Re-created Through a Comic Book

Sergio A. Salazar
Sponsor: Miroslava Chavez-Garcia, Ph.D.
Chicano Studies

My presentation is based on a media project done through a summer Chicana/o Studies Department class, "The Chicano Movement." The class combined historical readings, media making, and oral history to provide an opportunity to not only learn about history but also to create our own video oral histories by interviewing and documenting Chicana/o activists from the Sacramento region. During this course I learned much about the struggles of the Chicana/o community and the attempts of activists within our region to voice the injustices in our society. Like well-known activists such as Cesar Chavez, Sacramento activists made real change. After completing the media project, we (the students) presented the work to the activists in a community forum. My work did not end there. Rather, I (with another student) have developed a comic book to recount the experiences of creating this project. This presentation will demonstrate how a comic book can be not only an effective and fun way of sharing knowledge across a wide audience but also can provide readers with the tools or 'know how' for reproducing a similar video oral history project and disseminating knowledge across diverse audiences.

High Resolution Optical Imaging of Changes in Metabolic Activity of Human Breast Cancer Cells in Response to Molecular Targeted Therapy

Kiana Samadzadeh
Sponsor: Nitin Nitin, Ph.D.
Biological and Agricultural Engineering

Early, non-invasive evaluation of response of cancer cells and tissues to therapy is critical to determine efficacy of treatment and to develop individualized therapy for patients. Early identification of drug resistance in cancer cells can provide critical information to clinicians for considering alternative treatment options including surgery. In this research study, the focus is to determine specificity and sensitivity of molecular imaging approaches to detect drug resistance in breast cancer cells upon treatment epidermal growth factor receptor (EGFR) kinase inhibitor, gefitinib. The molecular imaging approach is based on quantification of changes based on uptake and retention of glucose (2-NBDG (fluorescent analog of deoxyglucose)) and propagyl choline (click chemistry analog of choline) in cancer cells respectively. Two breast cancer cell lines, MDA-MB-231 as a gefitinib resistant line and BT-474 as a gefitinib sensitive line, were analyzed. The results demonstrated that these imaging approaches have higher sensitivity and specificity than conventional cell survival assays to evaluate response of breast cancer cells to molecular targeting therapeutic agents.

Maternal Verbal and Affective Style on Language Development in Children with Fragile X or Typical Development

Emily A. Saneski
Sponsor: Dean Simonton, Ph.D.
Psychology

Numerous studies attested that verbal communication is impaired in children with fragile X syndrome (FXS). Severe hereditary mutations on the FMR1 gene of the human X chromosome lead to characteristic developmental differences in FXS children. Of great concern is how the type of lexical environment provided by primary caregivers can mediate their child's language difficulties. This observational case study compares dimensions of maternal speech to their son's language scores. The study's first objective is to measure overall levels of maternal verbalization to their typically developing son or son with FXS. No significant difference is predicted in the absolute production of maternal speech, but that processes differ between dyads where the sons are matched for mental age. The second goal is to examine whether maternal affective tones of the verbal directives have an effect on their child's standardized receptive and expressive language scores. Language data is drawn from 15- minute video recordings of unstructured play sessions between two young males and their biological mothers. Results from the statistical evaluation will underscore differences in the linguistic profiles between typically developing males and those with FXS, and this will be useful to delineate future language intervention strategies for families.

Toward Activation and Reduction of CO_2 Using Redox Active Complexes

Francisco J. Sarabia
Sponsor: Louise A. Berben, Ph.D.
Chemistry

The abundance of carbon dioxide permits its use as a renewable C1 source for the production of more useful products such as liquid fuels. Through activation by a Lewis acid, CO_2 reduction could occur allowing the formation of these products without high activation barriers. Specifically we will use aluminum as the Lewis acid because of its highly electropositive character. Since aluminum is not redox active, an iminopyridine ligand scaffold capable of storing two electrons in the same system could be used to donate electrons to CO_2. Bulky ligands will be used to enforce a low coordination number. When synthesizing the redox active aluminum complexes, ether is bound to the complex. This prevents the binding of CO_2, however this shows that the complex is oxophilic and thus has the potential to activate and reduce CO_2. Further research is being done in order to remove ether from the existing aluminum complexes. This combination of a highly Lewis acidic, low coordinate aluminum center along with a redox active iminopyridine ligand scaffold could allow binding and reduction of CO_2 to more useful products like methanol and formaldehyde.

Response to Solicitation of Agonistic Aid in Captive Rhesus Macaques (*Macaca mulatta*)

Margarita T. Saucedo
Sponsor: Lynne A. Isbell, Ph.D.
Anthropology

Rhesus macaques (*Macaca mulatta*) live in multi-male, multi-female matrilineal groups that exhibit high rates of aggression, often involving polyadic agonistic alliances and solicitations of agonistic aid. Previous studies of agonistic alliances in macaques have found that younger individuals, victims of aggression, or kin are more likely to receive agonistic aid, with females and older individuals lending aid at higher frequencies. These studies stress the importance of hierarchal rank in coalition formation (with higher-ranking individuals being the most favored allies), yet few studies distinguish between voluntary and explicitly solicited agonistic aid. Conflicts involving solicitation of aid among 24 captive rhesus macaques at the California National Primate Research Center were observed. I recorded the identity, sex-age class, hierarchal rank of and relationships between participants and used non-parametric statistical tests to determine the factors that elicit a successful response to solicitation of agonistic aid. As one of the first studies to analyze the response to solicitation of agonistic aid in both male and female participants, this research aims to reveal whether rhesus macaques exhibit a strategy in their solicitations of agonistic aid based on previous attempts and the resulting responses.

Project Collifornia: The Microbial Ecology of Collimonads at the Jug Handle Reserve

Natalie A. Sawaya
Sponsor: Johan Leveau, Ph.D.
Plant Pathology

The current research aims to further elucidate the ecological roles of a newly discovered genus of bacteria known as *Collimonas* which are known for antifungal, mycophagous and mineral weathering capabilities. The purpose of the ongoing 'Project Collifornia' aims to establish the microbial ecology of collimonads at the Jug Handle State Natural Reserve (SNR) in Mendocino, California. The Jug Handle SNR is the perfect site to research *Collimonas* ecology due to its Ecological Staircase that features three terraces that have varying gradients of soil properties, nutrient availabilities, microclimates and plant communities that affect their respective microbial communities. Metagenomic soil DNA extracts taken from the various terraces were analyzed using quantitative real-time PCR (qPCR) to quantify total bacteria, a *Collimonas*-specific probe-based PCR assay and 454 pyrosequencing. Higher concentrations of collimonads were found in the lower-most terrace, in nutrient rich areas and in the mineral layer of the soil. Future research aims to determine the microbial community structure and diversity in the soil by further analysis of pyrosequencing data as well as to characterize the antifungal and other properties of isolated Californian collimonads.

Gelation Time of Fibrin Hydrogels is Dependent on Microsphere Composition

Phillip Schaecher
Sponsor: Kent Leach, Ph.D.
Biomedical Engineering

Fibrin hydrogels are a promising candidate biomaterial to fill orthopedic defects as they utilize natural wound healing mechanisms for remodeling and repair. However, new methods are necessary to improve the osteoconductivity of these constructs to ensure an adequate osteogenic response and promote the integration of the implant with the surrounding tissue defect *in vivo*. We are examining the capacity of biomineralized substrata to enhance biomaterial osteoconductivity when used to fabricate composite implants. In this study, we quantified changes in gelation time when supplementing fibrin hydrogels with biomineralized or non-mineralized microspheres. We measured the optical absorbance of gels without microspheres (blank), or supplemented with non-mineralized or mineralized microspheres with and without aprotinin over time using a spectrophotometer. By differentiating the resulting kinetic curves and taking the maximum value, we estimated the gelation time for each hydrogel. Our data demonstrate that the inclusion of mineralized microspheres significantly shortens the gelation time, while non-mineralized microspheres added at the same concentration had no significant effect. These results suggest that gelation time is dependent on the type and form of microsphere inclusion, a fact that may be used to optimize fibrin composites for use in clinical settings.

Cytotoxicity of Silicon Nanoparticles in Hepatocytes

Sarah M. Schneider
Sponsor: Angelique Louie, Ph.D.
Biomedical Engineering

Nanotechnology offers exciting possibilities for potential applications in biomedical imaging because multiple properties can be integrated into a single entity. Quantum dots (QDs), in particular, are an attractive platform for building multimodality imaging probes to improve diagnostic accuracy. Silicon (Si) QDs are a new class of materials with several advantages, such as brighter fluorescence and lower toxicity, over the traditional QDs that makes them very attractive for bio-applications. However, questions about their potential toxicity remain unanswered and must be studied in detail before classifying them as completely safe for clinical use. The intent of this project is to study the effects of Si QDs with different surface ligands (-NH_2, -COOH and -OH) on primary hepatocytes. Hepatocytes isolated from rats and grown *in vitro* serve as a representative liver model. Preliminary results show that Si QDs are not cytotoxic and do not appear to induce cell death. This is very promising and will lead to further studies, including live animal cytotoxicity studies to evaluate the potential of Si QDs to be used for *in vivo* applications.

Investigating Pain in Children Undergoing Iliac Crest Bone Grafting Surgery with Alveolar Clefts

Louis J. Schuetter
Sponsor: Janice Lee, M.D.
Surgery

The uses of autogenous iliac crest bone grafts (ICBG) are considered the gold standard for intra-oral augmentation. This study examined pain experienced by children patients who underwent ICBG procedures to repair alveolar cleft anomalies. It will be determined if pain is a significant issue in post-operative surgery of children associated with anterior iliac crest bone grafts (ICBG) in intra-oral augmentation. The study explored the issue of increased pain at the donor site: iliac crest, where bone grafts are harvested vs. the oral cavity (receiving target site), where bone grafts are transplanted to fill voids or recesses in the bone tissue in the oral cranial maxilla region. Qualitative Assessment of pain on children patients was administered via patient pain questionnaires and retrospective records. Pain assessment utilized a modified 0-10 Numeric Rating Scale (NRS) based on data obtained from patients treated at the UCSF Craniofacial Clinic. Results are preliminary due to limited sample size, but currently indicate pain in the oral alveolar site is minimal in intensity and duration and conversely significant in the iliac crest region. The study is ongoing and currently demonstrates pain is significant in children undergoing anterior iliac crest bone harvest for alveolar cleft region.

A Green Fluorescent Protein (GFP) Screen for Novel Disc Proteins in *Giardia intestinalis*

Albert C. Sek
Sponsor: Scott Dawson, Ph.D.
Microbiology

The zoonotic parasite *Giardia intestinalis* infects nearly 33% of individuals in developing countries in a condition known as giardiasis. Infection occurs by the accidental ingestion of *Giardia* cysts that may persist in the environment for several months; an infected individual may shed up to 10 billion cysts daily. In the small intestine, *Giardia* excysts into a flagellated form, the trophozoite, and attaches to the villi by means of a unique cytoskeletal structure, the ventral disc. The disc is a 9 um concave spiral of cross-linked microtubules that allows it to attach and avoid peristalsis. Few proteins of the ventral disc are known, and identifying the composition of the ventral disc will help in understanding its mechanism of attachment (i.e. its pathogenesis) and possible drug targets. We detergent extracted ventral discs and identified 51 potential disc associated proteins by proteomic analysis. Genes encoding these proteins were cloned with their native promoters and a GFP tag was fused to the C-terminal end. Each plasmid was then transformed into *Giardia*. The localization of expressed proteins was determined by epifluorescence microscopy and tubulin immunostaining. We discovered 15 new proteins localizing to the ventral disc, disc edge, bare area, axonemes, and posterior notch.

College and Social Class: Extending Lareau to High School Students

Ashley Severson
Sponsor: Diane Wolf, Ph.D.
Sociology

The inspiration for my research is Annette Lareau's findings in *Unequal Childhoods*, an in-depth study of African American and white families from various class backgrounds. Lareau presents two distinct patterns of parenting dependent upon a family's class background. Data shows how children from middle to upper class backgrounds gained a "home advantage" from their family's resource, and tended to be more successful within elementary school than children from working to lower class families. My research project aims to further explore Lareau's findings with high school students. I question how juniors and seniors from working to lower class backgrounds navigate the process of deciding what to do after high school. I utilized interviews, surveys, and observations of students and school personnel at two northern California high schools. By comparing both middle-income and low-income students, my data reflects that low-income students aspire to higher education but do not have adequate preparation or knowledge about college and the application process to operationalize it. I argue that the underrepresentation of low-income students in higher education is not a problem of aspirations but of preparation and planning. Schools must do a better job of preparing low-income students for college and helping them gain admittance.

IAPP Oligomer: A Biomarker of Diabetic Cardio-Renal Dysfunction

Sachi Shah
Sponsor: Florin Despa, Ph.D.
Pharmacology

Islet amyloid polypeptide (IAPP) is an amyloidogenic protein making up the amyloid deposits within pancreas, the hallmark of type-2 diabetes mellitus (DM2). It is increasingly appreciated that the toxic form of amyloidogenic proteins is not amyloid but smaller membrane-permeant oligomers. Our laboratory reported that IAPP toxic (≥ 16 kDa) oligomers circulate through the blood, accumulate within the heart in patients with DM2 and alter cardiomyocyte function. As IAPP is normally cleared through kidneys, we hypothesized that patients with kidney failure but no DM2 may also show elevated circulating levels of IAPP toxic oligomers. To test this hypothesis, we measured the extent of IAPP toxic molecular species in serum samples from dialysis patients with DM2 (N=6) and obesity (OB), but no overt DM2 (N=7). As control, we used serum samples from lean (L) individuals (N=7). Western blot analysis with an anti-IAPP antibody revealed a 40-50% increase of the IAPP toxic oligomer level in OB and DM2 patients vs. L controls. The presence of elevated IAPP toxic oligomer levels in the serum of dialysis patients suggests a possible increased risk of cardiac dysfunction in these patients. Further studies will be focused on the assessment of cardiac IAPP oligomer accumulation in dialysis patients.

Enantioselective Synthesis of Substituted-3-Hydroxy-2-Oxindoles and Spirocyclic Oxindoles

Karamjeet K. Sheikhon
Sponsor: Annaliese K. Franz, Ph.D.
Chemistry

Substituted oxindoles and spirocyclic oxindoles are scaffolds of various natural products and biologically active pharmaceutical lead compounds. The structural diversity and biological activity of the oxindole-containing natural products make them primary targets in synthetic organic chemistry. Allylsilane nucleophiles are known to react with carbonyl electrophiles to access the allyl-substituted product or the silicon-containing [3+2] ring annulation product. We have developed a method for the enantioselective allylsilane allylation of isatins employing a chiral scandium-ligand complex as a catalyst. The reactivity of different Lewis acid catalysts was compared to the scandium catalyst complex in isatin allylation reactions. The role of $AgSbF_6$ and TMS-Cl has been investigated and shown to enhance catalytic turnover. We have also investigated the ligand effect on the enantioselectivity and reactivity of the scandium catalyst complex in reactions that gave the 3-allyl-3-hydroxy-2-oxindoles in excellent enantioselectivity and good yields. The reaction products were characterized by mass spectrometry (MS) and NMR spectroscopy, and enantioselectivity was examined by chiral high-performance liquid chromatography (HPLC). We are currently investigating the addition of propargyl silane to isatin to produce a 3-allenyl-3-hydroxy-2-oxindole product.

Annexin 2 Regulation of S100-A10

Alexander J. Sherman
Sponsor: Clare Yellowley, Ph.D.
School of Veterinary Medicine

Previous experiments have shown that levels of annexin 2 protein, a calcium-dependent phospholipid binding protein, increase under low oxygen tension (1%), hypoxia. Besides organizing exocytosis of intracellular proteins, annexin 2 is thought to be involved in several signal transduction pathways and regulate cellular growth. We investigated whether S100-A10, a cytoplasmic protein involved in numerous cellular processes including differentiation, and a binding partner of annexin 2, also increased in mouse osteoblasts cultured under hypoxic conditions. Cells were placed in 1% oxygen for a 24 hour period and RNA and protein samples were isolated. Quantitative RT-PCR was performed to measure S100-A10 gene expression, and Western blots were used to quantify protein. Under low oxygen tension, S100-A10 increased in mouse osteoblasts when compared to cells cultured under 21% oxygen. In addition, in cells where annexin 2 levels were decreased using siRNA, S100-A10 levels were also significantly reduced compared to control. Further experiments are underway to determine whether annexin 2 directly regulates expression of S100-A10.

Phylogenetic Position of the *Maddenia* Group Within *Prunus* (Rosaceae), Evidence from Pollen Morphology

Wenting Shi
Sponsor: Daniel Potter, Ph.D.
Plant Sciences

Maddenia (Rosaceae), which consists of about six species from eastern Asia, was long recognized as a genus distinct from *Prunus*. Recent molecular studies provided evidence that this group is nested within *Prunus*, having a close relationship with the *Padus-Laurocerasus* complex. Therefore, *Maddenia* was transferred to *Prunus*. To further test the phylogenetic position of *Maddenia*, this study investigates pollen morphology of all former *Maddenia* species and about 25 other *Prunus* species, using scanning electron microscopy. These *Prunus* species represent the subgroups *Padus* (bird cherries), *Laurocerasus* (cherry-laurels), *Cerasus* (cherries), *Prunus* (plums and apricots), *Amygdalus* (almonds and peaches), and *Pygeum* (African plum trees and tropical Asian cherries). We found that pollen grains of these groups are all monad and tricolporate. Their equatorial outlines range from circular to triangular. Pollen of *Maddenia* is most similar to that of the *Padus* group in surface sculpture with longer, thicker and irregularly elevated striations, whereas pollen of the *Cerasus* group has thinner and predominantly parallel striations. The pollen grains of *Maddenia* are quite distinct from those of the *Pygeum* group which have much shorter, wrinkled and rod-shaped striations. The pollen evidence supports a close relationship between the *Maddenia* and *Padus* subgroups.

Elucidating the Physiological Basis for Altered Yield, Fruit Number and Harvest Index in Three Transgenic Tomato (*Solanum lycopersicum L.*) Lines

Prabina Shrestha
Sponsor: Diane M. Beckles, Ph.D.
Plant Sciences

Carbohydrates determine sweetness and yield of tomato fruit, two important economic drivers of the industry. Three lines, each over-expressing different transcription factors, were selected to because they altered leaf carbohydrate levels and may regulate partitioning of carbohydrates from leaf to fruit. Based on our preliminary data we hypothesize that these three transcription factors (TFs; TF-1, TF-2 and TF-3) may affect yield in part by affecting root growth, CO_2 fixation and expression of the *fw*2.2, (a gene known to regulate fruit size). First, root growth was measured periodically in lines grown *in vitro*. Second, the amount of chlorophyll and protein was assayed. Lastly, expression of the *fw*2.2 gene in flower buds was measured using semi-quantitative RT-PCR. Data from the transgenic lines were compared to the untransformed control line. Our results on the possible role of the *fw*2.2 in determining our tomato fruit phenotype were inconclusive. However the rate of root elongation was altered during the early stages of development in TF-1, and the amount of protein per μg of chlorophyll has been reduced in TF-3 leaves, partially supporting the hypothesis that these TFs may regulate partitioning of carbohydrates from leaf to fruit in part by affecting root growth and CO_2 fixation.

Pyridostigmine Bromide Protection Against Acetyl Cholinesterase Inhibition by the Organophosphate Diisopropyl Fluorophosphate

Imteaz Siddique
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Environmental Toxicology

The use of organophosphate (OP) pesticides, such as chlorpyrifos (CPO), underline the importance of adequate safety measures to protect mixers, loaders, applicators, farmers, and the public. The experiments presented here concern pyridostigmine bromide (PB), a carbamate, treatment as a means to reduce the effects of OPs on farm worker exposures. Red blood cells (RBCs) from the UC Davis dairy herd were incubated with PB, diisopropyl fluorophosphate (DFP), an accepted surrogate pesticide, and appropriate controls to investigate the extent of PB protection of acetyl cholinesterase (AChE), an enzyme important for nerve impulse transmission, present in mammalian RBCs. The RBC samples were collected, washed in saline, and assayed in triplicate using the colorimetric Ellman assay to determine AChE activity. The experiments show that RBCs pretreated with PB recovered 94% AChE activity after 9 hours. RBCs treated with DFP alone were inhibited 96% and showed no recovery. Simultaneous treatment of PB and DFP protected 79% of AChE activity after 2 hours and showed 93% recovery after 9 hours. These results support that PB treatment can provide protection from OP exposure.

The Enantioselective Synthesis of Spiroindolones Catalyzed by Asymmetric Acids Can Help Promote a Cure for Malaria

Abel Silva Garcia
Sponsor: Annaliese K. Franz, Ph.D.
Chemistry

In recent literature, a new class of spiroindolones has been shown to possess antimalarial activity, inhibiting the *Plasmodium falciparum* parasite responsible for an estimated 40% of persistent public health problems for the world's population, mainly in sub-Saharan Africa. The synthetic challenge in making these spiroindolones is based on the exquisite setereoselectivity for drug and receptor chiral bonding interaction, for only one enantiomer is more efficient having an IC_{50} = 9nM. My research addresses an efficient preparation of these spiroindolone structures using a catalytic enantioselective Pictet-Spengler reaction. In my research I demonstrate that asymmetric acids and other chiral hydrogen donors promote high enantioselectivity for the reaction of tryptamine and isatin derivatives to give high yields of spiroindolones. The Pictet-Spengler reaction has been shown to work with functional groups such as aldehydes and ketones, but it has not been reported in literature with the reactants employed in this research. My poster will discuss reaction optimization with a range of different asymmetric catalysts, additives, solvents, and temperatures. The goal of my research is to make optically-enriched spiroindolones and to develop methodology for making other chiral scaffolds for drug discovery and chemical biology applications.

Metabolic Quantification Using GC-CI-QQQ-MS

Mark Silveria
Sponsor: Oliver Fiehn, Ph.D.
Molecular and Cellular Biology

Metabolomics aims at comprehensive identification and quantification of all metabolites in a biological system. Yet, reporting absolute quantification levels is difficult to achieve. We have explored quantification of arrays of compounds using gas chromatography-triple quadrupole mass spectrometry with chemical ionization (GC-CI-QQQ-MS). Each metabolite has its own standard quantization curve, so in order to quantify metabolites by using GC-CI-QQQ-MS standards these curves must be prepared before trying to determine an unknown concentration. We prepared quantification curves for 50 common metabolites by injecting different concentrations into the GC-CI-QQQ-MS and graphing molecular ion peak heights versus concentration. Samples were first derivatized using trimethylsilylation by MSTFA and protection of carbonyl groups by methoximation to increase volatility and injected at concentrations ranging from 0.5-100ug/ml. After quantification curves were prepared, samples of unknown concentrations were analyzed. The unknown sample was then injected into the GC-CI-QQQ-MS and peak heights of metabolites were compared against our known standard concentration curves. We found that quantification works better at higher concentrations but is still possible down to 5ug/ml. Lower limits of quantification were thus far higher than expected, likely due to the chemical ionization used in this protocol.

The Role of MECT1- MAML2 in Site-specific LOH and DNA Fragmentation

Katrina K. Slemmons
Sponsor: Andrew Vaughan, Ph.D.
Radiation Oncology

Loss of heterozygosity (LOH) is an important factor in the genesis and development of tumors as it can disrupt normal tumor suppressor gene function through the specific deletion of those genes. Previously, LOH was thought to occur randomly after the introduction of DNA double strand breaks-such as those induced by irradiation. However, the H292 mucoepidermoid carcinoma (MEC) cell line has shown reproducible tracts of LOH at 11q21-23 after 4 Gy radiation, demonstrating that LOH can be site-specific. This cell line also showed site-specific DNA fragmentation at the telomeric extent of the observed LOH. The MECT1-MAML2 fusion gene is a unique characteristic of this cancer line and has been shown to deregulate CREB signaling, an important element in transcriptional regulation. MECT1- MAML2 is thought to activate a set of CREB regulated genes and consequently maintain tumor cell growth. We propose that the MECT1-MAML2 translocation in MEC tumors is involved in either this site-specific DNA fragmentation, LOH, or both. To test this hypothesis, siRNA is used to down regulate the expression of the fusion gene product. The resulted effects on the frequency and location of DNA fragmentation and LOH will be determined through LM- PCR and SNP analysis.

Cultural Frame Switching and Self Construal Among Chinese American Biculturals

Alexander J. Sloan
Sponsor: Richard W. Robins, Ph.D.
Psychology

Cultural norms often affect views of the self. Individuals from more individualistic societies display greater independent self construals than do individuals from more collectivist societies, who often show more interdependence in their construals of the self (Markus & Kitayama, 1991). The use of cultural primes can mimic cross-cultural differences in cognition, a phenomenon known as cultural frame switching (CFS) (Hong, Morris, Chiu, & Benet-Martinez, 2000). Biculturals' level of bicultural identity integration (BII), or the extent to which they successfully integrate their two cultural identities, moderates the CFS effect (Benet-Martinez,Leu, Lee, & Morris, 2002). Thirty-four foreign-born Chinese American students were randomly assigned to a Chinese, American, or Juxtaposed (1 Chinese and then 1 American) cultural prime condition. A significant interaction emerged between prime condition and BII level. Among high BIIs, those in the American condition reported higher levels of independent self construal than those in the Chinese condition. However, among low BIIs, those in the American condition reported lower levels of independent self construal than those in the Chinese condition. These findings imply that biculturals who regularly integrate their dual cultural identities assimilate the self toward activated cultural norms, whereas less integrated biculturals contrast the self away from activated cultural norms.

Efficient Pathways for the Development of a γ-Lactam Spirocyclic-oxindole Pilot Scale Library

Austin Smith
Sponsor: Jared T. Shaw, Ph.D.
Chemistry

High-throughput screening has become an increasingly popular avenue of discovery finding biologically active lead compounds for pharmaceutical development. Further growth of novel chemical libraries containing chemical scaffolds designed to mimic biologically active natural products is crucial to the growth and productive output for high-throughput screening facilities. By utilizing a multi-component stereoselective reaction to produce a common γ-lactam spirocyclic-oxindole core we have established an efficient synthesis of a small molecule library with a broad range of potential biological activity. Functionalizing at key areas around our core structure will provide the diversity required for lead compound development. Successful biological activity and development of any lead compound from our library will be greatly aided by the efficient synthesis that can quickly produce more of the lead compound and diversify its functional groups for further expansion. Diversification of the core structure is achieved by modifying the substrate used in a one-pot click reaction or acylation on the final step of the synthesis.

Dirac Point Degenerate with Massive Electronic Energy Bands at a Topological Quantum Critical Point

Justin C. Smith
Sponsor: Warren E. Pickett, Ph.D.
Physics

The electronic band structure describes the behavior of electrons in a crystalline solid, viz. metallic vs. insulating; magnetic; etc. From this, and the characters of individual bands, we can determine the low-energy properties of the material. The quasilinear bands in the topologically trivial insulator CoSb3 are studied under adiabatic, symmetry-conserving displacement of the Sb sublattice. In this time-reversal and inversion symmetric system a transition from trivial to topological insulator occurs through a critical point involving a point Fermi surface where massless bands are degenerate with massive bands. Spin-orbit coupling, a consequence of special relativity, coupled with tetragonal strain opens the gap in the band structure that is required to give the topological insulator state. In its natural state CoSb3 is near the critical point, which we have pinpointed by performing a small internal distortion plus an overall tetragonal symmetry-breaking strain. This same process will be applied to isovalent compounds to learn whether they undergo the transition under more convenient conditions. This subclass of "skutterudite" topological insulators displays unique properties at low temperature, though industrial applications remain to be determined.

Rip Currents at South Salmon Creek Beach: Dynamics and Flow Characteristics

Daniel Sousa
Sponsor: John Largier, Ph.D.
Environmental Science and Policy

Salmon Creek Beach is a long (~5 km), exposed, Westward-facing reflective beach near Bodega Bay, CA. It is bounded by Mussel Point to the South and Arched Rock to the North. Despite hazards such as sleeper waves, undertows, and rip currents, Salmon Creek remains a popular site for recreation. Studying the temporal and spatial variability in flow dynamics of a readily-identifiable rip current near the South end of the beach, this project provides a sense for both the large-scale spatial patterns and fine-scale disorder inherent in such a complex system. Observations document a rip current over a two-week time period that was temporally consistent in location but variable in strength and direction. GPS tracks of drifters deployed into the rip current from the surf zone indicate that the sheltering effect of Mussel Point dominates the flow characteristics of this area. The limited time scale of this project leaves many questions unanswered; a larger scale monitoring of the area is suggested. Correlation of rip current properties to environmental conditions such as air and water temperature, swell height, wind speed and tidal variability are tentative, and a comprehensive and precise description of rip current response to these factors remains to be described.

Design and Analysis of a Small Hybrid Engine Aircraft

Justin A. Spahn
Sponsor: Cornelis Van Dam, Ph.D.
Mechanical and Aerospace Engineering

This research project concerns the design and theoretical testing of a small electric-gasoline hybrid aircraft. It is a two-seat civilian transportation vehicle, designed to take-off and land on a 1600 foot runway, and cruise at 80 knots for at least one hour while using not more than one gallon of gasoline. Design and analysis are guided by aircraft performance standards as stated by the American Institute of Aeronautics and Astronautics, and established methods published by aircraft designers such as Dr. Jan Roskam. The aircraft will be analyzed in terms of performance standards and comparison against similar, internal combustion-powered aircraft such as the Cessna 152. Design goals are the development of a clean-energy alternative to modern aircraft, and maximization of hybrid engine efficiency. This research is purely theoretical, relying on software simulations to represent an imaginary design model. It is conducted under the mentorship of Professor C. P. van Dam, chair of the Department of Mechanical and Aerospace Engineering. The design will be presented using performance data, and representations of the aircraft. Data collection and analysis are being conducted at this time, but the project will be completed and ready for presentation by the Conference date.

A Screen for Physical Interactors of the Yeast Pch2 Protein

Jacob Spector
Sponsor: Sean Burgess, Ph.D.
Molecular and Cellular Biology

Meiosis is a series of two cell divisions that gives rise to haploid gametes. In order for chromosomes to properly segregate to daughter cells during meiosis, crossovers between homologous chromosomes must form. If crossovers between homologs do not form properly, missegregation of chromosomes, or nondisjunction, can occur. In budding yeast, the Pch2 gene is involved in crossover interference and acts in a meiotic recombination checkpoint. This meiotic recombination checkpoint ensures proper segregation of chromosomes by arresting cells that do not have normal crossover patterns. One suggested function of Pch2 is in sensing and signaling the unprocessed double strand breaks that lead to crossover formation. The yeast Pch2 protein has been shown to interact with Xrs2, which is part of a complex that processes double strand breaks. My experiment, a yeast two hybrid screen, will identify other proteins that physically interact with Pch2 and further illuminate the role that Pch2 plays during meiosis.

The Developmental Time-course of Sluggish Cognitive Tempo in ADHD

Henry P. Stanley
Sponsor: Julie B. Schweitzer, Ph.D.
Psychiatry

Attention Deficit Hyperactivity Disorder is a psychiatric disorder which emerges in childhood, often persists into adulthood, and is characterized by deficits in sustained attention and impulse control. While initially conceived as a unitary disorder, ADHD is currently understood to consist of 3 subtypes based on which symptom clusters are predominant; these subtypes are known as inattentive, hyperactive, and combined (both). A symptom cluster known as Sluggish Cognitive Tempo (SCT) - characterized by inattention, daydreaming, and drowsiness - as recently been shown to identify a subset of patients within the inattentive and combined subtypes, and may be of use in directing future diagnosis and treatment. In this study we examined the developmental time-course of SCT, using cross-sectional data on 52 individuals ranging in age from 8 to 18. Our sample was divisible into three similarly sized diagnostic groups: inattentive subtype ADHD, combined subtype ADHD, and healthy controls (no hyperactive-only diagnoses were found). Participants' degree of SCT was assessed using a parent behavior rating scale; a positive trend was found between age and SCT score only in the two ADHD groups, suggesting that SCT may worsen over the course of development in a subset of patients with ADHD.

Perfect Plastic

Meredith Sward
Sponsor: Julie Wyman, M.F.A.
Art Studio

The female body is a canvas for alteration, change, and comparison. The media and plastic surgeons foster ideas about what is beautiful, and influence the ever-growing number of women and girls with poor body image. After completing twelve interviews with eight plastic surgeons, two academics, a psychologist, and reviewing countless media sources and articles, I have concluded that the media's effect on women's self image is now leading more women to plastic surgery as a way to transform into an ideal. Surgeons have told me in interviews, that plastic surgery television shows in the late 1990's and early 2000's led to an increase in their patient-load. Because of the recent coverage of celebrity plastic surgery and the shows like *Bridalplasty* and *Dr. 90210*, the goal of self perfection through outer appearance transformation is more sought-after than ever. My final project, an experimental documentary, critically examines how women objectify their bodies to reward the male gaze. In the presentation, I will show excerpts from my documentary, discuss the media's adverse effect on women's self esteem, and explore why such women pursue the radical and unfortunate choice of plastic surgery with the hope of realizing happiness.

Post-Translational Modifications: Flipping the Switch on MeCP2 Regulated Gene Expression

Ryoe W. Takakura
Sponsor: Janine M. LaSalle, Ph.D.
Medical Microbiology & Immunology

Post-translational modifications are covalently attached molecules on specific amino acids within a protein which can change that proteins function. A single protein may contain many of these modification sites to help it control and perform a variety of different functions. Rett syndrome is a rare neurodevelopmental disorder observed in females that carry a mutated allele of the Methyl CpG Binding Protein 2 gene (MECP2). MeCP2, which controls the expression of genes that are important for neuronal development, has many sites for post-translational modifications. However, the effects of most post-translational modifications on MeCP2 function are unknown. Therefore, to study their effects, multiple MECP2 mutants were made which are incapable of undergoing post-translational modification at specific sites. The mutants are tested in cultured cells to study each mutants' effect and therefore the requirement for specific post-translational modification on the expression of MeCP2 regulated genes. Further discoveries in the relationship between post-translational modification of MeCP2 and neuronal gene expressions may lead to a better understanding of how deficiencies in MECP2 can lead to Rett Syndrome.

Analysis of the Inflammatory Potential of Human Dietary Lipids on Aortic Endothelium

KaYan Tam
Sponsor: Scott I. Simon, Ph.D.
Biomedical Engineering

We wished to examine the capacity of human aortic endothelial cells (HAEC) grown in culture to take up and metabolize triglyceride rich lipoproteins (TGRL) isolated from subjects after a high caloric meal. The experimental objective was to determine if low density lipoproteins would alter the inflammatory potential of HAEC. To efficiently test many subjects, we developed a protocol for isolating then preserving the TGRLs for subsequent analysis. To determine optimize the preservative vehicle, we tested 10% trehalose in solution, 10% sucrose in solution, and frozen TGRLs without preservative, and compared them to fresh TGRLs non-frozen. We measured the particle size of the TGRLs and then compared their bioactivity by quantifying membrane expression of VCAM-1 on HAECs to an inflammatory stimulation with TNF-α. Although the particle size distribution of TGRLs was preserved by the sugars, they decreased the capacity of TGRLs to amplify inflammatory response of HAECs. In contrast, particle sizes of frozen TGRLs increased, but its capacity to enhance inflammation was unaltered. We conclude the inflammatory potential of TGRL on HAECs is not dependent on particle size distribution, but rather TGRL composition. We have developed an effective preservation method to bank subjects' TGRL for subsequent analysis of inflammatory potential.

Conversion of Cyclohexanone Catalyzed by Platinum Supported on Alumina: Reaction Network

Kevin M. Tay
Sponsor: Bruce Gates, Ph.D.
Chemical Engineering and Materials Science

The conversion of cyclohexanone catalyzed by Pt/γ-Al2O3 with a co-feed of H_2 was investigated with a flow reactor at 573 K and 140 kPa. About 35 reaction products were identified by gas chromatography-mass spectrometry, the most abundant being phenol by far, along with benzene, cyclohexane and cyclohexanol. This relationship to phenol links cyclohexanone to the reaction networks of prototypical bio-oil compounds such as guaiacol and anisole where phenol is a major product. The kinetically significant reaction class was determined to be hydrogenation. Catalytic removal of oxygen was shown by the production of cyclohexane, cyclohexene, and benzene. Oxygen removal selectivity increased with increasing H_2 partial pressure. Selectivity-conversion data will be used to determine an approximate quantitative reaction network encompassing the major products, and a qualitative network will be inferred from the identified products. The completed cyclohexanone reaction network will serve as a supplement to the networks of prototypical bio-oil compounds already investigated.

Quantification of Urinary HDL Loss in Immunoglobulin A Nephropathy

Natalie Telis
Sponsor: J. Bruce German, Ph.D.
Food Science and Technology

Immunoglobulin A Nephropathy (IgAN) is a serious kidney disease with limited diagnostics available. IgAN patients have dramatically lower high-density lipoprotein (HDL) concentrations and HDL particle numbers compared with healthy controls. HDL is protective against heart disease, the risk of which is already elevated in IgAN patients due to renal hypertension. In other forms of kidney disfunction, HDL levels are similarly low while triglycerides carried in very low density lipoproteins (VLDL) and their remnants are high. High triglycerides are also a risk factor for heart disease. It is known that lipidated HDL are catabolized by the liver and that HDL lipidation occurs in part due to increased plasma triglycerides. However, the involvement of the kidney in HDL excretion is not well understood. The analysis of HDL and its constituent apolipoprotein A-I (ApoA-I) in the urine of patients with IgAN will allow a better understanding of HDL loss in renal disease. To investigate whether increased excretion of free ApoA-I and/or whole HDL particles occurs in IgAN patients, we measure ApoA-I by ELISA and the HDL particles by immunoprecipitation. These methods, as well as cholesterol enzyme analysis, and microscopy in urine of IgAN patients and controls will be presented in this project.

The Hôtel de Soubise: Interior Design and Ornament in 18th Century Paris

Leelye Tesfamariam
Sponsor: Mark Kessler, M.Arch.
Design

This study is an investigation of interior architecture and design in Paris's Hôtel de Soubise (1700-1740) and more generally the Parisian Hôtels of the early to mid 18th century. Specific emphasis has been placed on the artistic, social, cultural and political motivations behind the design of interior ornament. Structures designated the title of hôtel during the time spanning 1550-1800 were city mansions constructed for, and inhabited by, the French nobility. The development of the hôtel building type, and the design of their interiors, in the early to mid 18th century was greatly marked by the prominence of the ornate rococo style. Incorporation of highly detailed ornament played an integral role in the grandeur of rococo interiors. The 1732-1740 interior renovation of the Hôtel de Soubise, under the direction of architect Germain Boffrand, exemplifies French rococo interiors and ornament at their finest. I have been able to study Boffrand's designs and the ornament that characterizes them through the examining of photographs, illustrations and architectural documents as well as the reading and analyzing of scholarly material. This evaluation reveals Boffrand's and the French rococo's intent to convey principles greater than simply aesthetic beauty in interior design.

Validation of a Techinque to Analyze Non Transferrin Bound Iron

Cortney P. Thompson
Sponsor: Kathryn G. Dewey, Ph.D.
Nutrition

An essential element in plasma is iron, which is usually bound to a transport protein called transferrin. Iron that is not bound to transferrin is labeled as Non-Transferrin Bound Iron (NTBI)-which is one of the main focuses of our research. NTBI is believed to be available to participate in oxidative reactions in the blood, which can lead to tissue and DNA damage. Excessive intake of iron could potentially cause elevated levels of NTBI within the blood, which is a concern for lactating women because they have a low requirement for iron. We have previously conducted a study at the UCD Medical Center, where lactating women were given prenatal vitamin supplements with or without iron for 3 months. We are interested in the levels of NTBI within the plasma in subjects who took supplements with iron versus those without the iron content. Our main focus is attempting to validate a method of measuring the amount of NTBI within the plasma sample by creating columns packed with transferrin antibodies bound to a gel. Plasma is pipetted into the columns, where transferrin binds to the antibodies. What flows through the column is NTBI. Western blots show that the columns worked as planned.

Selling a Sexier World: Negotiations of Class, Sexuality, and Citizenship

Stephannie A. Tornow
Sponsor: Julie Sze, Ph.D.
American Studies

Sex shops have branched out from being solely merchandise-based to attempting to sell "sexuality" in the form of sexual workshops. Sex shops and private companies sell classes where adults can learn how to become better sexual partners or just more in tune with their sexual selves, giving them a space in which to practice their performance of their sexual identity. Through an ethnography of workshops at Good Vibrations in San Francisco, this study examines how members use these workshops to negotiate their class status, where certain expressions of sexuality are one characteristic that inherently separates them from different classes. Participants use these workshops to overlap their private desires with public expressions of their class. In this space, sexuality becomes a classed structure in which private individuals of a certain class have rights to commodifed sexual freedom. Good Vibrations' workshops serve as a space to negotiate class boundaries and conflicts through the lens of sexuality. Women in these workshops promote narratives of private choice and personal responsibility in their sexuality while creating a system based around social and consumer hierarchies.

The Circadian Clock Regulates Plant Growth Response to High Temperature Pulses

Huy D. Tran
Sponsor: Julin N. Maloof, Ph.D.
Plant Biology

Both temperature and time are important factors in plant development. Exposure to high temperature results in a striking change in plant growth, and the plant's internal oscillator (circadian clock) determines when during the day plants can grow. The interaction between temperature and circadian regulation of plant growth is not well understood because most prior research has been performed under constant temperature. My research focuses on the effect of temperature on the plant circadian clock and growth. I am studying the changes in growth rhythms of six different *Arabidopsis thaliana* genotypes: *Columbia-L, Wassilewskija, Circadian Clock'Associated 1, Phytochrome-Interacting-Factor 4 (PIF4-ox), Phytochrome-Interacting-Factor 5 (PIF5-ox)*, and the double mutant *pif4pif5*. I use time-lapse photography and diurnal manipulation to examine the temperature effects on plant growth rhythms and how the circadian clock regulates temperature response. I found that *PIF4-OX's* peak growth occurs once every 24 hours under low/high temperature pulses. My data leads to the hypothesis that heat may stabilize PIF4 protein with 24 hours rhythmicity to induce elongation, and the circadian clock controls the temperature signaling in *PIF4-OX*. My future experiments include using western blots to look at *PIF4/PIF5-OXs*' protein levels in low/high temperature pulses.

Revival of Forgotten Techniques: The Elizabethan Ruff

Nidia Trejo
Sponsor: Susan Avila, M.F.A.
Design

In the mid 16th century, the most notable fashion accessory in all royal courts was the ruff, an extravagant neckpiece. As Renaissance cultural ideals drew focus to the individual, the ruff emphasized the wearer's face and mind. A circular collar, the ruff was typically made of linen or lace and projected outward from the neck with pleats stylized as figure eights. Utilizing artwork and literature from the Renaissance as well as modern recreations of the ruff, my research focuses on how the ruff was constructed and stiffened with rice starch. Particular interest was taken in learning more about hand sewing techniques that are rarely used today due to advancements in sewing machinery, like small folds called cartridge pleats that gave volume to the ruff. The use of rice water as the starch was significant to revive a simple and benign method for stiffening. Historically, ruffs required frequent laundering and re-starching. They promoted immobility, servant aid, and concealed signs of aging. Through the process of recreation it is easy to understand why the ruff conveyed such high status.

Does a Melody Facilitate the Learning of a Grammatical Pattern in 15-month-old Infants?

Elizabeth J. Tremaine
Sponsor: Katharine Graf Estes, Ph.D.
Psychology

What aspects of music facilitate language learning in infants? Previous research has shown that the statistical redundancies of music, or consistent pairings of lyrics with a melody, help both infants and adults learn new language sequences. But is this redundancy all that facilitates language learning? Melodies may hold an infant's attention via pitch and rhythm variation. These characteristics are also representative of Infant Directed Speech, or the sing-song language repeatedly shown to facilitate language learning in infants. In this experiment, we have removed the redundancies from musical input. 15-month-old infants were exposed to an artificial grammar set to a melody. However, the same notes were never paired with the same grammatical phrases, removing the hypothesized learning mechanism of musical input. The results confirm that redundancy is, in fact, an important aspect of musical learning and suggest that Infant Directed Speech's ability to facilitate language learning relies on more than exaggerated pitch and rhythm variation.

Identification of Novel Peptide Ligands Targeting Leukocyte αLβ2 Integrin

Harry P. Tseng
Sponsor: Kit S. Lam, M.D., Ph.D.
Biochemistry and Molecular Medicine

Peptides are promising targeting agents'they are small, chemically stable, easy to synthesize, and can be readily conjugated to toxins, radionucleotides, or drugs. Our lab hypothesizes that by screening peptide combinatorial libraries against cancer cell lines, peptides can be selected and engineered to recognize the αLβ2 integrin, which is important for immune response and leukocyte recruitment. The "one-bead one-compound" (OBOC) combinatorial libraries developed in the Lam lab consists of millions of beads, each displaying one unique peptide entity. Several OBOC-focused combinatorial libraries were designed, synthesized, and screened against the αLβ2 integrin for ligands with higher binding affinity. We incubated the libraries with the cell line in culture using a whole cell binding assay, allowing us to select the candidate peptide sequences displayed positive binding. We have isolated positive beads from one library containing the Asp-Gly-Arg (DGR) peptide sequence and are currently further analyzing the data to determine the specific sequence requirements for binding. Further assessment of the affinity and kinetics of integrin-peptide binding will be performed using flow cytometry.

Changing Chromosome Conformation by Spindle Pulling Forces

Enkhee Tuvshintogs
Sponsor: Sean Burgess, Ph.D.
Molecular and Cellular Biology

Inappropriate gene expression can lead to cancer. Normally, gene expression is regulated by the physical properties of chromosome structure. Expressed genes are associated with open chromatin whereas silenced genes are associated with condensed chromatin. Large-scale genome rearrangements can lead to the formation of dicentric chromosomes where there are two spindle attachment sites on one chromosome. Thus, when the spindle pulls the chromosome in opposite directions the stretching force may have long-lasting consequences. Our hypothesis is that this stretching will open the chromatin and allow expression of silenced genes. I will construct strains of *S.cerevisiae* that have two centromeres, flanking a region that is normally silent. Activation of a reporter gene within the silenced region will be measured. Positive results of gene expression could explain a possible mechanism of how genes are inappropriately expressed in cancer cells. This would give us another level of understanding about the changes leading to the formation of malignant tumors.

Imperial Power in the Cave at Sperlonga

Cristina I. Urrutia
Sponsor: Lynn E. Roller, Ph.D.
Art History

In the first century CE the Roman state was ruled by the Julio-Claudian Dynasty and Tiberius, the adopted son of Augustus, developed the pre-existing villa at present day Sperlonga in the Bay of Naples as a vacation retreat. Like other villas of Roman elites, the villa at Sperlonga included a natural grotto, used by the emperor Tiberius for theatrical dinner parties. Through visual analysis, literary and historical sources I examine the reemergence of the Greek Hellenistic style, which emphasized drama, pathos, and theatricality seen in the earlier Greek sculptures of *Laocoon* and the *Altar of Pergamon* and demonstrated in the Sperlonga sculptures. I examine the revival, under Tiberius, of Homer and Virgil's literature to emphasize the connection that links the geography of Italy to the heroic journeys of Odysseus and Aeneas. Grandiose compositions depicting such mythological literature, specifically four moments of Odysseus' travels, were transferred to sculptural programs, which decorate not only Tiberius' cave at Sperlonga but also the villas of the imperial family. As I will demonstrate, the influence of Hellenistic Greek sculpture and the literature of Homer and Virgil on the sculptural program at Sperlonga and other imperial villas were emphasized to reflect Roman imperial power.

An Investigation of Fruiting Body Development in *Myxococcus xanthus*

J.B. R. Urtecho
Sponsor: Mitchell Singer, Ph.D.
Molecular and Cellular Biology

Proteins with a GGDEF motif are believed to impact fruiting body development in *Myxococcus xanthus*. The motif that defines this group of proteins is important for dicyclic GMP production, which is involved in polysaccharide synthesis that is important in the development of the fruiting body. I hypothesize that genes that encode GGDEF proteins regulate the speed of fruiting body development, either slowing down or speeding up the fruiting body development. I am testing both the importance of GGDEF proteins and, by extension, the region of the genome that governs them. I have created knockouts of GGDEF encoding genes by homologous recombination. To accomplish this, PCR and primers were used to generate inframe deletions in order to create a plasmid without the region of interest. This plasmid was then transformed back into the bacteria and phenotypic analysis will be conducted on the resulting bacteria, which will have undergone homologous combination. The speed of fruiting body development will be assessed to determine if GGDEF proteins do in fact regulate fruiting body development.

Exploring the Evolution of CENH3 in Brassicaceae

Joel T. Valencia
Sponsor: Simon Chan, Ph.D.
Plant Biology

The centromere is defined by the presence of CENH3, a rapidly evolving histone H3 variant required for chromosomes segregation. Alterations in CENH3 cause segregation errors of mitosis in embryos. Haploid *Arabidopsis thaliana* progeny can be produced by replacing the rapidly evolving N-terminal tail of CENH3 with the N-terminal tail of H3, creating a 'tailswap' transgene. When the 'tailswap' plant is crossed to a wildtype the chromosomes of the mutant parent are lost in a 'genome elimination' event, resulting in wildtype haploid progeny. Haploids, a powerful tool for plant breeding, create truebreeding lines in one generation after being reconverted to diploids. Because genome elimination is induced by alterations to the tail of CENH3, we propose that the fast-evolving tail may have some role in speciation. We will determine if the genome elimination effect in *A. thaliana* can be reproduced by introducing orthologous CENH3 proteins from close relatives into *A.thaliana*. To determine the degree of difference required to produce haploids, CENH3s from *B. rapa, A. arenosa, C. flexuosa, L. oleraceum,* and *C. hirsute* will be introduced into a *cenh3* mutant and crossed to wildtype. A range of phenotypes from no complementation through haploid inducing to full complementation is expected.

Research with Low Literacy Asians: Testing the Feasibility of an Audio-Assisted Touch-Screen Computer Program

Mai C. Vang
Sponsor: Tonya Fancher, M.D.
General Medicine

BACKGROUND: The purpose of our study is to examine the feasibility of using an audio-assisted touch-screen computer program compared to face-to-face (FTF) interview to administer 4 previously validated measures (HSCL-10 [a depression measure], Morisky Adherence Scale, Treatment Credibility, and Loss of Face) among a convenience sample of Hmong and Vietnamese. METHOD: 10 Hmong and 9 Vietnamese completed the 4 measures on the computer and again 2 weeks later in a FTF interview. A bilingual bicultural assistant was available to assist. Paired sample T-test was used to compare scores. RESULTS: 19 participants were recruited. Results from both the computer assessment and FTF interview show that subjects had similarly high medication adherence, high treatment credibility, and high face concern. Using the computer program, 5 of 19 participants met the cut-off score for depression based on the HSCL-10 but only 1 out of the 5 met the cut-off in the FTF interview. CONCLUSION: Using a touch-screen audio assisted computer program is feasible among Hmong and Vietnamese research participants. The difference in the HSCL-10 scores between the computer assessment and FTF interview may reflect participants' discomfort with FTF interviews, reluctance to report depressive symptoms, and high face concern.

Using Reverse-Taxonomy in Order to Obtain a Significant Estimate of Soil Nematode

Ambarish C. Varadan
Sponsor: Steven A. Nadler, Ph.D.
Nematology

Despite advancements in molecular techniques over the past century, relatively little is known or understood about the diversity of nematodes in desert soil habitats. Previous approaches that aimed to investigate nematode biodiversity were based on metagenomics, and the results of studies based on those approaches failed to represent nematode species that were known to be present in the samples, and showed no correlation between the frequencies of DNA sequences and the number of individuals of each species in the samples. This study will utilize an alternative approach focused on species-level morphological identifications of nematodes, otherwise termed as "reverse taxonomy". This approach consists of three stages. The first stage involves the usage of high-resolution Light Microscopy (LM) in order to capture digital images of nematodes at multiple focal planes. The second stage incorporates the processes of DNA extraction, Polymerase Chain Reaction (PCR), and gene(s) sequencing that pertain to the specific nematode. The third stage essentially combines the results of the aforementioned two stages, thereby enabling us to quantify species-level diversity of soil nematodes. Through this approach, we expect to develop a better understanding of the relative abundance and diversity of soil nematodes.

The Role of Neuronal Activity in Dendritic Spine Formation

Hugo Vega-Ramirez
Sponsor: Karen Zito, Ph.D.
Neurobiology, Physiology and Behavior

Functionally relevant structural changes in the mammalian brain occur in response to experience. These changes happen at the subcellular level and are observable along the dendrites of excitatory neurons. Dendritic spines are microscopic protrusions lining the dendrite and serve as sites of excitatory synapses. Spines are constantly changing size, forming and disappearing, thereby mediating changes to the circuitry of the brain. Although spine dynamics have been extensively characterized, little is known about the signals leading to new spine outgrowth from the dendrite. One model posits that spine outgrowth is spontaneous, whereas a second model proposes that spine outgrowth is directed by neurotransmitter release from a nearby axon. We hypothesize that blocking action potentials with TTX and blocking postsynaptic responses with the glutamate receptor antagonists, CPP and NBQX, will reduce the number of spines formed, demonstrating that spines form in an activity-dependent manner. To test this hypothesis, I used two-photon microscopy to repeatedly image the dendrites of rat pyramidal neurons from the hippocampus in the presence or absence of CPP, TTX, and NBQX. Preliminary data reveal a trend toward decreased spine formation in the absence of activity, suggesting that neuronal activity in the brain plays a role in spine formation.

The Chicano Movement: Using Media Production for the Betterment of the Community

Lizbeth A. Velasco
Sponsor: Miroslava Chavez-Garcia, Ph.D.
Chicano Studies

My presentation focuses on the work carried out in a Chicana/o Studies summer class, "The Chicano Movement". The class incorporated the usual historical aspect while also integrating oral history and media into the learning process. This was made possible through interviews of Chicano movement activists from the Sacramento region. Through this process, we the students learned how media projects go far beyond the realm of the written word. This presentation showcases highlights from that experience by presenting an overview of the class, student experiences, and a video clip which can be found on YouTube. After the completion of these presentations, as a class, we presented the finished media projects to the activists and community. These media projects highlight different perspectives that are normally lost when reading books alone. The interviews and media-making relate to class material, thus forcing students to make connections and analyze how individual effort and sacrifice led to the driving force of the Chicano Movement. Through this presentation we built a strong relationship between student and professor while retying relations with activists within our own region. This empowering experience exemplifies the importance of interactive learning and how it shapes how students gain a newfound knowledge.

Identification of an Unknown Virus in a Rabbit Population with Fatal Gastrointestinal Disease

Eric M. Velazquez
Sponsor: Connie Champagne, Ph.D.
Molecular and Cellular Biology

A laboratory rabbit population at the University of Tennessee's College of Veterinary Medicine experienced a high mortality gastrointestinal disease outbreak. A severe parasitic problem was identified and follow-up electron microscopy revealed an unidentified virus-like particle in sick but not healthy animals. Attempts at isolation of the virus in culture and identification by PCR were unsuccessful. I hypothesized that this virus could be identified by comparing DNA and RNA from infected to uninfected rabbits. My goal was to identify unique sequences that might have originated from the virus. For this, I used the Virochip, a DNA microarray that is capable of identifying known viruses and discovering novel viruses. Reactivated latent herpesvirus was present in some sick rabbits but not in healthy ones. I also found endogenous retrovirus sequences in most sick rabbits and in one healthy rabbit. My results do not support my hypothesis as I was unable to detect a viral signature that could be linked to the unidentified particle. One possibility is that these viruses may not be linked to the fatal disease outbreak in the rabbits. Alternately, the particles may not be actual viruses.

Quantification of Bacterial Populations on Tomato Surfaces Based on 16S rRNA Real Time PCR (qRT-PCR) as Alternative to Culture Dependent Techniques

Tam N. Vo
Sponsor: Trevor V. Suslow, Ph.D.
Plant Sciences

Quantification of bacterial populations can reflect microbiological status of vegetable products. Culture dependent techniques can be time consuming and rarely reflect total bacterial population as only 1% of bacteria can be cultured. Quantification of the number of copies of the 16S rRNA gene can be an alternative. This work aims to compare the effectiveness of qRT-PCR to determine total bacteria populations on tomato surfaces with culture dependent techniques. Validation of qRT-PCR was performed to determine reproducibility, detection limit and PCR reaction conditions and efficiency. Mature green fresh tomatoes (n=50) were processed to detach bacteria from tomato surface. Bacterial suspension was utilized to quantify bacteria using direct plating and to isolate DNA for further 16S rRNA quantification. Amplification reaction with standards evidenced the formation of heteroduplex which reduced reaction efficiency when low concentrations of template DNA were present. Quantification of bacterial population on tomatoes was comparable between culture dependent techniques and qRT-PCR, however direct planting often showed higher bacterial populations likely result of inefficient lysis during DNA extraction. Likely qRT-PCR can provide a rapid assessment of the bacterial population in vegetable products, however technique optimization is needed to successfully apply qRT-PCR as standard technique.

Gender Bias in American Politics: The Media's Modern Witch-Hunt

Hayley A. Voudouris
Sponsor: Benjamin Highton, Ph.D.
Political Science

Past studies have indicated that the media portrays female candidates in a more negative and stereotypical context than their male counterparts, giving them less coverage and twisting their projected self-image. In this study, I examine media biases against women running for elective office in the United States and aim to determine whether the media prefers women who exhibit "female" traits to those who come across as having more "male" traits, like aggressiveness, when campaigning. I hypothesize that the more aggressive, or the more "male" a candidate is, the more likely she is to have problems with the media. This project will utilize coverage of women's campaigns for the U.S. House, Senate and Executive branch from the 1990's to 2010. I also anticipate a correlation between modern media biases and historic western misogynistic stereotypes about women, such as the concept of "witch-hood" in early modern Europe. I assert that "witches" and female politicians can be compared because western patriarchal culture historically fears what these women have, do and represent.

In vivo Cytotoxities of Novel Amiloride Congeners in an Intracerebral Glioma Xenograft Model

Thanh M. Vu
Sponsor: Fredric Gorin, M.D.
Neurology

Malignant gliomas (brain tumors) proliferate and infiltrate the surrounding brain tissue even following treatment with surgery, radiation therapy, and chemotherapy because dormant remnant cancer cells (i.e. cells that have been halted in their growth cycle) can reactivate the cell cycle. Conventional anticancer treatments lack the cytotoxic mechanisms to target gliomas in cell cycle arrest, which is one reason why some glioma cells circumvent current treatments. Thus, there is considerable need for research to develop new therapeutic agents that prevent glioma recurrence by targeting glioma cells which have undergone cell cycle arrest. Previous experiments have shown that the drug amiloride, is selectively cytotoxic to proliferating and non-proliferating gliomas. We are optimizing the cytotoxic mechanisms of amiloride by correlating the compound's *in vitro* cytotoxicity with its *in vivo* cytotoxicity. Cell cultures are used to identify which amiloride derivatives are most potent. The most efficacious compounds will be tested in our intracerebral glioma xenograft mouse model to determine *in vivo* efficacies. I am measuring several pharmacokinetic parameters of our drug to establish a dosing strategy, and I am testing *in vivo* efficacies of our drug. Initial results indicate that one of our amiloride derivatives delays glioma growth by several days.

Fabricating Hmong American: Using Indigenous Textile Motifs to Embrace a Bicultural Identity

Song Vue
Sponsor: Susan Avila, M.F.A.
Design

Over the past thirty-five years in the U.S., it has been a growing struggle to preserve the ethnic and cultural identity of the Hmong, an indigenous group originating in Southeast Asia. Acculturation has caused young Hmong Americans to dismiss their cultural heritage. Traditional Hmong textile motifs, however, remain unchanged and recognizable as symbols of cultural identity. My research focuses on the use of traditional Hmong motifs as a source for revitalizing ethnic and cultural appreciation within Hmong American youth, specifically through the ideation and production of a fashion signature collection in modern day context. Instead of using embroidery and appliqué techniques, as found in traditional Hmong attire, digitally printed fabrics and various hand dyeing techniques- using fiber reactive dyes- will convey motifs in a new and different way. I hope that the pairing of these reoccurring symbols with the fresh color palette, fabrics, and contemporary silhouettes will bring new appreciation and commend youth for their Hmong ethnic and cultural heritage.

The Epidermal Growth Factor Receptor and *Drosophila melanogaster* Tarsal Bristle Patterns

Gerard M. Vurens
Sponsor: Artyom Kopp, Ph.D.
Evolution and Ecology

The epidermal growth factor receptor (EGFR) plays a key role in the receptor tyrosine kinase pathway. Involved in intercellular signaling across taxa, the receptor tyrosine kinase is critical to the regulation of a variety of cellular processes. In many fruit flies of the *Drosophila* genus, male-specific structures known as sex combs develop. These ordered configurations of thickened pigmented bristles, known as teeth, form distal or anterior to the transverse bristle rows. Their formation is not fully understood, but involves the determination of the bristles, followed by their assembly and, in some species, their rotation. Previous studies have indicated that EGFR is involved in the ordering and development of other bristles on the basitarsus, proximal to the sex comb. In this study, we show that reducing the expression of EGFR using RNA interference (RNAi) can disrupt this process. The localized knockdown of EGFR at specific periods during development appears to interfere with the organization of sex comb teeth: additional teeth form and are disorganized. A more complete understanding of the role of EGFR in Drosophila tarsal bristle patterning could help create a new model for studying a vital and conserved pathway with applications across taxa, including in humans.

Underparked: Balancing Community Needs with State Goals

Whitney E. Wais
Sponsor: Frank W. Hirtz, Ph.D.
Human and Community Development

The Bayview neighborhood of San Francisco has long suffered from inadequate housing, economic divestment, and racial segregation. The historical marginalization experienced by this African-American community has resulted in uneven development and controversial land-use decisions. This uneven development is evinced through a lack of city parks and the placement of a State Recreation Area (Candlestick Point) in a heavily urban neighborhood. The focus of State Parks' is recreation and tourism, which requires outsider visitation. Because city planning has been focused on attracting outsiders, community needs have not been met. The shortage of neighborhood park space has resulted in community uses of Candlestick Point. Due to the mismatching of intended and actual users of Candlestick, conflicts have arisen. Using qualitative interviews, historical analysis and quantitative mappings, I will show that Candlestick Point should operate differently in order to provide for the community's needs. I argue that because of the marginalization of Bayview, Candlestick Point must be run with a different set of goals and policies than other State-run parks. I hope to illustrate that it is in the best interest of State planners to take into consideration an urban parks' surroundings and needs of the local residents.

Yeast-two Hybrid Screening to Identify UNC-84 Binding Partners

Allen Wang
Sponsor: Daniel A. Starr, Ph.D.
Molecular and Cellular Biology

Recent evidence suggests that integral membrane proteins that function inside the nucleus are actively transported there by multiple mechanisms. Using the inner nuclear membrane protein UNC-84, which functions to position nuclei in *Caenorhabditis elegans*, we have identified four signals that aid in its localization to, and retention at, the nuclear envelope. I hypothesize that identifying UNC-84 binding partners will help elucidate the mechanisms of these signals. To identify UNC-84 binding partners, a yeast two hybrid screens was performed using UNC-84(1-510) as bait. One million clones were screened and fourteen different potential proteins were identified. Three of the proteins are uncharacterized, one has been identified as mitochondrial fusion protein, two are proposed to function in ER to Golgi, one plays a role in nuclear signaling, and another is a component of the nuclear lamina. The potential binding partners screened shows promising results in localizing and retention of UNC-84 since nuclear lamina is known to participate in establishing the nuclear envelope, it is suggested to have a function in the retention of UNC-84 to the inner nuclear membrane. While proteins that form the vesicles from ER to Golgi transport suggest that UNC-84 is actively transported.

The Multicultural Experience and Cultural Grounding of Biracial Individuals

Emily L. Wang
Sponsor: Nolan Zane, Ph.D.
Psychology

An overwhelming amount of recent research suggests a large growth in the number of interracial marriages and multicultural individuals (CensusScope, 2000). With this increase comes little evidence of how biracial individuals navigate multiple cultures and racial groups. The present study undertakes a qualitative approach to examine the biracial experience. Using data from 60 first-generation biracial University of California, Davis students and affiliates (ages 17-35), results demonstrate that biracial individuals feel that their inherent multicultural experience affords them the opportunity to be more accepting of and open-minded towards a variety of different cultures. At the same time however, this dual cultural experience may also lead the biracial individual to judge the depth at which they are able to participate in their multiple cultures. When biracials choose to identify more with one culture over another, this lack of strong cultural grounding may lead to feelings of displacement. This study explores both the positive and negative aspects of having an inherent multicultural experience.

Melanin Production Pathway as Potential Osmoregulatory System in *Daphnia pulex*

Nellie E. Wilcox
Sponsor: Dietmar Kueltz, Ph.D.
Animal Science

Daphnia pulex is a crustacean arthropod that primarily grows in freshwater environments. Our lab is interested in looking at the mechanisms these animals use to combat salinity stress. We noticed an interesting phenotype, in which animals recovering from salinity exposure become pink. Previously obtained spectrophotometric data shows absorbance peaks at similar wavelengths to those produced by oxidation of the melanin pigment. Oxidized melanin gives off a pinkish color compared to standard state or reduced melanin; additionally, pheomelanin, one of the three main classes of melanin, is a red/ yellow pigment. Other arthropod studies correlate the production of melanin pigment with the response to oxidative stress, which is one of main consequences of salinity stress. Therefore, I hypothesize that increased melanin production is an important osmoregulatory strategy utilized by *D. pulex* under salinity stress. To test this, animals were exposed to control (no salinity) conditions and acute salinity conditions. Levels of mRNA for two genes [melanin concentrating hormone (MCH) and DOPA decarboxylase (Ddc)] will be compared between control and salinity-stressed organisms using quantitative real-time PCR. MCH aggregates melanocytes inside melanophores to produce pigmentation, and Ddc was used previously to detect increasing levels of melanin pigment production.

Promoting Anti-Tumor Effects Using a CD40 Stapled Liposomes

Temesgen Woldeyesus
Sponsor: Kit S. Lam, M.D., Ph.D.
Biochemistry and Molecular Medicine

Currently, many therapeutic drugs are administered systemically with minimal specificity, rapid clearance, and frequent side effects, resulting in low therapeutic efficacy. The Irvine group has developed a lipid-based drug delivery system-stapled liposomes-which can deliver sustained release of a potent monoclonal antibody (mAb) to create a strong and protective anti-tumor immune response. The anti-CD40 mAb has been shown to stimulate robust cytotoxic T cell responses against syngeneic murine lymphomas, proving to be a promising candidate for therapeutic delivery. I wish to utilize the slow controlled release as a therapeutic advantage. I also wish to efficiently target lymphoma tumors via delivery of anti-CD40 stapled liposomes conjugated to the surface of *ex vivo* cultured T cells. I am testing the hypothesis that homeostatic trafficking of T cells to target the anti-CD40 stapled liposomes to the lymphoma tumors allowing for localized release of potent anti-CD40 mAb. I have shown through SDS PAGE analysis and *in vitro* experiments that encapsulated anti-CD40 is conserved structurally and is still functional. I will next investigate (i) the liposomes targeting ability *in vivo* and (ii) the liposomes therapeutic efficacy. I envision the targeting efficiency of these liposomes will allow for a localized delivery and strong anti-tumor effects.

Enantioselective Synthesis of Biologically Active Oxindole Compounds by Addition of N-methylpyrrole to Isatins

Casey J. Wong
Sponsor: Annaliese K. Franz, Ph.D.
Chemistry

Chiral substituted 3-hydroxy-2-oxindoles have been identified as core structures in many pharmaceutical compounds. We are developing an efficient enantioselective and regioselective method for the addition of N-methylpyrroles to various isatins. Our synthetic method uses a chiral Lewis acid metal catalyst (Indium (III)-(S,R)-indapbox) that increases the reactivity of the isatin electrophile and induces enantioselective addition of the N-methylpyrrole to isatins. We have observed that additions of N-methylpyrroles to N-methylisatins proceed with yields and enantiomeric excess greater than 90%. By testing our reactions with varying combinations of Lewis acids, solvents and temperatures, we were also able to produce one major regioisomer greater that 90%. Our next step is to explore the addition of N-methylpyrrole to various other N-substituted isatins using the same catalytic method as described. For isatins with lower reactivity, we are investigating $AgSbF_6$ to create a cationic indium complex that could potentially increase the Lewis acidity and activity of our catalyst complex.

Geographic Variation in the Cost of Thermal Tolerance in Marine Copepod

Irene Wong
Sponsor: Rick Grosberg, Ph.D.
Evolution and Ecology

Temperature is one of the most important sources of stress for intertidal organisms. Previous data show that the intertidal copepod *Tigriopus californicus* is locally adapted to temperature, but the variation in thermal tolerance is much narrower within each population when compared to the species as a whole. This pattern suggests that there are costs of adaptation (i.e., trade-offs) to particular temperature regimes. Specifically, what are the trade-offs to evolving higher thermal tolerance in *Tigriopus*? To answer this question, we conducted laboratory selection experiments. We first selected copepods within each population for higher thermal tolerance. We then compared the fecundity and generation time of these selected copepods to unselected controls to determine possible costs of adaptation to higher thermal tolerance. Experiments show that although the southern populations have different fecundities and generation times than those of northern populations, there were minimal differences between selected and unselected copepods within each population. Although fecundity and generation times were not determined to be costs of small changes in thermal tolerance, differences in these traits among regions suggest a possible cost to larger differences in thermal tolerance that have evolved over longer time scales.

Examining R-Loop Formation by a Non-Coding RNA Arising from the Prader-Willi Critical Region on Chromosome 15

Spencer Wong
Sponsor: Janine LaSalle, Ph.D.
Medical Microbiology & Immunology

Most of the DNA in our cells is transcribed into RNA, but most of the RNA does not code for proteins, and in recent years the purpose of non-coding RNA (ncRNA) has become an active area of research. The purpose of this research is to determine the function of ncRNA arising from the imprinted locus 15q11-13 in neurons. Loss of the ncRNA leads to Prader-Willi Syndrome. My hypothesis is that the transcription of the ncRNA in *SNRPN-UBE3A* leads to R-loop formation across a 150 kb region. R-loop formation occurs when a G-rich RNA hybridizes to its C-rich DNA template, leaving its coding strand as a single stranded region. Using bisulfite conversion I probed for regions of R-loop formation. Bisulfite conversion requires the presence of single-strand DNA (ssDNA) and converts cytosines to uracils, allowing me to probe for the single strand region of an R-loop. Using conversion-specific primers and PCR I was able to detect regions where one strand is in a single strand conformation, but its complementary strand is not, suggesting the presence of an R-loop. Further investigation involving RNAse H treatment will be done to confirm the presence of R-loops.

Fair Use in National and International Asia: Case Studies on Otaku Culture

Brian Wu
Sponsor: Karma Waltonen, Ph.D.
University Writing Program

Copyright originated from the 16th century printing press in Europe and influenced its counterparts across the globe. Copyright is, however, underdeveloped in Asia because of the lack of this European concept. Copyright problems in Asian countries have been arising due to discrepancies about "Fair Use," part of the statutes intended to protect users during limited use. The objective of this research is to examine Asian Fair Use cases, reflect upon directions of media companies via modernization, and predict policy changes both nationally and internationally. Although international copyright agreements are supposed to establish minimal standards across the globe, the concept of Fair Use is rarely respected across international boarders. Because of unauthorized derivative works and falling sales of media from the violation of Fair Use, the otaku culture (a phrase referring to a nerd-conscience subculture with obsessive interests) were attacked as the scapegoat. This research focuses on current events where Fair Use issues are targeted towards the otakus. The research would demonstrate the urgency to better define Fair Use: not only to protect the industries being infringed, but also the subculture blamed for making derivative works. Pointing to these flaws would promote informed decisions for future amendments to this statute.

Identification of Methyl Accepting Chemotaxis Protein in Chemotactic Response to Organic Acids in *Pseudomonas putida*

Victoria Wu
Sponsor: Rebecca Parales, Ph.D.
Microbiology

Pseudomonads are Gram-negative, rod-shaped, obligately respiring bacteria. These organisms are motile in liquid environments by use of external rotating organelles called flagella, and they can grow on a wide variety of organic compounds. Specific membrane-bound proteins called methyl accepting chemotaxis proteins (MCPs) operate as receptors that bind specific chemicals, and transmit signals to the flagella to control the direction of movement. Many bacteria can also sense the energetic state of the cell, and this is creditable to their *aer* gene. The genome of *Pseudomonas putida* strain F1 encodes 27 MCP genes, which is significant compared to organisms like *Escherichia coli*, which only have 5. In order to functionally characterize the MCPs in *P. putida* F1, we have individually deleted each of the 27 MCP genes and also created double mutants lacking the *aer* and MCP genes. To test for defective chemotaxis responses, we used swarm plate assays, which consist of semi-solid agar plates containing the test attractants as the sole carbon source. The double mutant Δ*aer*Δ*4520* displayed a reduced response to succinate, malate, citrate, and fumarate. These results suggest that the MCP encoded by gene 4520 is responsible for the ability of *P. putida* F1 to sense these organic acids.

Divergence of Pheromone Profile and Modification of Associated Neural Circuitry in Fruit Fly *Drosophila prolongata*

Xiao Sandy Xie
Sponsor: Artyom Kopp, Ph.D.
Evolution and Ecology

Cuticular pheromone signals are used by many insects for social interactions and courtship identities. *Drosophila prolongata* is sexually dimorphic in several unique aspects, including a 10-fold increase in chemosensory bristles on the male foreleg. This dimorphism points to a probable role of sex-specific signaling molecules. We are interested in how pheromone production and reception differs in *D. prolongata*, and in modifications to the neural circuitry associated with these new chemical sensing organs. I will assay for expression of gustatory receptors in the derived bristles by RNA *in situ* hybridization to determine if pheromone response is a function of the additional bristles. I will also compare sex-specific pheromone profiles in *D. prolongata* and sister-species *D. rhopaloa* using gas chromatography to determine if chemosensory bristle expansion correlates with changes in pheromone production. I will also use axon backfilling along with IHC staining to map the neural circuitry responsible for processing sexual dimorphic sensory information in both sister species, to determine if recent evolution has also modified underlying neural morphology.

Chemotactic Potential of Fibrin Composite Gels

Dana Yakoobinsky
Sponsor: Kent Leach, Ph.D.
Biomedical Engineering

Fibrin gels have great potential for the repair of bone defects as they can be remodeled by the body's wound healing response. In order to promote repair, cells must be able to effectively migrate into these materials. We assessed the capacity of cells present in healing bone defects to migrate through osteoconductive fibrin gels. We measured the migration of cells through 1 mm thick engineered gels formed on culture inserts with four experimental groups: 1) gels containing 5 mg/ml apatite-coated polymer microspheres; 2) gels containing 5 mg/ml nonmineralized microspheres; 3) gels without microspheres; and 4) empty inserts. Human microvascular endothelial cells, mesenchymal stem cells, calvarial osteoblasts, and periodontal fibroblasts were seeded on top of the gels (or empty well) and cultured 7 days, after which we calculated an invasion index. Fibroblasts exhibited a high index for fibrin gels containing mineralized microspheres, endothelial cells and osteoblasts showed high invasion for the gels with no microspheres, and stem cells demonstrated their greatest migration through empty inserts with no significant differences between other groups. These osteioinductive differences *in vitro* achieved by the addition of non- or pre-mineralized microspheres suggest this might be beneficial in directing the *in vivo* osteogenic response of native cells.

Statins Inhibit Proliferation and Stimulate Apoptosis in Endometrial Stromal Cells

Toshia Ann Yamaguchi
Sponsor: Antoni J. Duleba, M.D.
Obstetrics and Gynecology

Our previous studies on the effects of statins on human endometrial stroma (HES) showed that statins may provide novel treatment for endometriosis, a common gynecologic disorder, due to statins' ability to inhibit HES growth. In this study, we compared effects of various statins on HES cells and evaluated Simvastatin, Lovastatin, and Pravastatin at 3-30μM and Atorvastatin at 1-10μM measuring DNA synthesis, viable cell number, and apoptotic cell death during 24-48h treatment. The number of proliferating cells decreased when treated with Simvastatin (by 40-90%), Lovastatin (by 20-76%), Pravastatin (by 20%), and Atorvastatin (by 20-40%) in a concentration-dependent manner. We also performed a Caspase-3/7 activity assay for 24h and 48h using Simvastatin, Lovastatin, Pravastatin, and Atorvastatin. There was a significant increase in caspase activity after 48h of treatment in cells treated with Simvastatin (10-25%), Lovastatin (7-19%), Pravastatin (6%), and Atorvastatin (6-10%). This *in vitro* study showed that statins inhibit proliferation and induce apoptosis in HES cells in a concentration-dependent manner, suggesting that statins are effective anti-proliferative drugs that could have clinical relevance in conditions such as endometriosis.

Effects of Maternal Vocalization and Heart Beat Rhythm on Reduction of Abnormal Behaviors in Rhesus Monkeys: A Study with Artificial Mothers

Angela Yang
Sponsor: Brenda McCowan, Ph.D.
California National Primate Research Center

Monkeys separated from their maternal mothers at birth display increased levels of abnormal behavior such as nonnutritive self-suckling, self-biting, and other motor stereotypies. Study show that by mimicking natural mothers, artificial mothers may decrease anxiety, comfort infants, and decrease abnormal behavior in captive monkeys. Surrogate mothers were made from plastic cylinders with fabric coverings and equipped with a rubber nipple and a button representing the heart. Surrogates were paired with infants from day one of life to four months of age. 12 Chinese and Indian Rhesus Macaques were split into two groups: 6 in a control group paired with surrogates that had no sound or heartbeat installed, the other 6 in an experimental group with surrogates equipped with prerecorded maternal calls connected to the rubber nipple that sounded when suckling occurred and a button that performed rhythmic heartbeats when pressed. Behaviors were observed and recorded based on a designated ethogram three times a week. Each monkey was observed for 15 minutes and behaviors were recorded every 15 seconds. Data was then compared between the experimental and control groups. The maternal vocalization and rhythmic heartbeats by artificial mothers is hypothesized to further decrease abnormal behavior when compared to the control group.

A Microstructural Study of Cryomilled Al-B_4C Nanocomposites

Hanry Yang
Sponsor: Julie M. Schoenung, Ph.D.
Chemical Engineering and Materials Science

Aluminum 5083 alloy - boron carbide (Al-B_4C) metal matrix composites (MMC) produced by cryomilling have attracted interest recently due to their light weight and high strength. Cryomilling is a mechanical milling process, during which the composite powder is ball milled in a liquid nitrogen slurry at cryogenic temperatures. Cryomilling breaks up the oxide layer inherently found on the as-received Al 5083 alloy powder surface while absorbing nitrogen from the milling medium thereby forming nitrides as a function of milling time. These impurity particles as well as the introduced carbides greatly enhanced the thermal stability of the cryomilled powder for subsequent consolidation and thermomechanical processing (degassing, hot isostatic pressing, extrusion, and/or forging). In this study, the effect of milling time, B_4C particle size, and consolidation variables on the microstructure of consolidated bulk nanocomposites was studied using scanning and transmitting electron microscopy (SEM and TEM, respectively). Attention was placed on the relation between the process variables and possible defects such as prior matrix particle boundaries and interface integrity between Al 5083 matrix and B_4C. The relationship between microstructure and mechanical properties of the nanocomposites are discussed.

Phenotypic Plasticity of Head Morphology in an Introduced Population of the Banded Watersnake (Nerodia fasciata) from an Isolated California Waterway

Catherine Yasuda
Sponsor: Brian Todd, Ph.D.
Wildlife, Fish and Conservation Biology

Snakes are a gape-limited species in which the maximum size of consumable prey is limited by head and jaw size of the snake predator. In several snake species, phenotypic plasticity of the jaw in response to prey availability may occur among individuals, between sexes, or as the animal grows in size. Over evolutionary time this plasticity can result in a permanent, genetically based change in head size or shape allowing niche partitioning within the species. Further, if phenotypic plasticity in head morphology is observed in a snake species it could indicate that the species has the potential to adapt to new prey sources, providing a possible advantage to the species if introduced to areas outside its native range. Here, I measured 14 traits associated with head morphology in an introduced population of banded watersnakes (*Nerodia fasciata*) established in Los Angeles County, CA. I quantify the degree of plasticity represented in the population and the degree to which the sexes differed in head morphology. These results will inform future comparisons with other native and introduced populations of this species across North America.

Effects of Pectinolytic Yeasts on Sicilian-style Olive Fermentations

Bianca K. Yau
Sponsor: Maria L. Marco, Ph.D.
Food Science and Technology

In 2007, large quantities of fermented Sicilian-style olives processed in California were ruined by a spoilage event in which the olive mesocarp was highly degraded. Higher populations of yeast were found in the degraded olives compared with normal olives. In November 2010, pilot-scale fermentations were initiated in which four strains of yeast (*Saccharomyces cerevisiae, Pichia manshurica saito, Candida boidinii,* and *Issatchenkia orientalis*) isolated from normal and spoiled olives were inoculated into the olive brines. This study, which is a portion of a large on-going project, monitored the pilot fermentations to quantify changes in the firmness (texture) of the olives in response to the addition of yeasts and to quantify the amounts of pectinolytic yeasts in those fermentations over time. This analysis has thus far shown that olives inoculated with *S. cerevisiae* conferred a significant decrease in olive firmness compared with uninoculated control olives. Olives directly injected with the yeast inoculants confirm that this strain of *S. cerevisiae* is able to induce olive softening. This project aims to evaluate the cause of spoilage due to olive softening in order to develop preventative measures to reduce losses of this economically important product.

Mars Science Laboratory (MSL) Landing Sites

Anahita T. Yazdi
Sponsor: Dawn Sumner, Ph.D.
Geology

Since the first close-up images of Mars in 1965, humanity has gained a better understanding of the Red planet's geology; however, it remains unclear whether Mars was ever capable of sustaining life. The 2011 Mars Science Laboratory (MSL) Mission and its rover, Curiosity, seek to determine whether Mars has ever had the environmental conditions favorable to microbial life. Hence the location of the landing site plays a pivotal role in obtaining samples. Four remaining landing site candidates are under consideration: Gale Crater, Eberswalde Crater, Mawrth Vallis, and Holden Crater. Dr. Dawn Sumner is a member of the MSL landing site steering committee. The primary software used in her research is Crusta, which allows real-time visualization of global topographic and imagery data. I have assisted Dr. Sumner in establishing a computer system to run Crusta and compiling Digital Elevation Models (DEM) and high resolution imagery of Mawrth Vallis and Gale. Throughout the course of this research, issues with software and data have arisen. Some include erroneous-georeference data in the image product header-files and radius-independent elevations in the DEM products. These problems have been resolved one by one. And now we can analyze the sites and present information in the final MSL Landing Site Workshop.

School-Level Factors in Rates of Student Completion of California Public Four-Year University Minimum Admission Requirements

Michele Yee
Sponsor: Kimberlee Shauman, Ph.D.
Sociology

In contrast to the assumption that achievement relies heavily on personal merit, sociology of education has identified school-level characteristics associated with students' postsecondary education attainment. These school-level characteristics include both academic, like the fraction of coursework offered at the school that is college-level, and non-academic, such as the proportion of students in the school receiving free or reduced price meals. Using data collected by the California Department of Education, I examine the proportion of students in California's public traditional high schools who complete minimum course requirements for admission into the University of California and California State University system. Furthermore, the study specifically looks at these completion rates by ethnicity. First, I describe the distribution of certain ethnic groups among the schools along various school-level characteristics, and I conclude African American students are not distributed like their Hispanic counterparts among California's schools. Next, I use multivariate regression to identify the independent strength of the association between school-level characteristics and the proportion of students who complete minimum course requirements for admission into the universities. I hypothesize the non-academic components of schools, in comparison to the academic characteristics, are more strongly correlated with student completion rates across all ethnic groups.

Crystallization of Abf2 Protein-DNA Complexes

Jiajia Ying
Sponsor: Enoch P. Baldwin, Ph.D.
Molecular and Cellular Biology

The goal of our project is to understand how the High Mobility Group (HMG) protein abf2p packages mitochondrial genome DNA (mtDNA). HMG proteins are found mainly in the eukaryotic nucleus, where they regulate transcription and replication. Abf2p is a mitochondrial HMG protein found in the budding yeast *Saccharomyces cerevisiae*. Abf2p bends and coils DNA for compaction and protection from DNA degradation and is essential for mtDNA maintenance. Abf2p contains 2 copies of a conserved 80 amino acids structural motifs called "HMG boxes". Most HMG proteins have multiple HMG motifs but no structure of a multi-HMG protein has been solved. Studying Abf2p-DNA structure will reveal how HMG motifs can cooperate to bend DNA. Our first goal is to gain diffraction quality Abf2p-DNA crystals, collect data and solve its structure. We are currently screening buffers of different concentrations and pH values under different temperatures to find optimum conditions in which our crystals can grow. The Abf2p-DNA structure will have broad implications about HMG functions in general.

A Comparative Analysis of Na+/K+ ATPase Activity in Daphnia spp. Under Alternate Osmolyte Exposure

Candice Young
Sponsor: Dietmar Kueltz, Ph.D.
Animal Science

Daphnia are freshwater crustacea that are able to tolerate a variety of stressors and live under variable environmental conditions. The goals of this two-part study are to characterize and compare two different Daphnia species (*Daphnia Pulex and D. magna*) by 1) establishing 96-hour LC50 levels for four osmolytes (NaCl, KCl, sodium gluconate, and glycerol) and 2) analyzing the effects of these osmolytes on active ion transport by assessing Na^+/K^+ ATPase activity. Two strains from each species are studied to allow inter- and intra-species comparisons for a total of four different strains. For the experiment, sets of 10 randomly selected 7 day-old Daphnia from each strain are exposed to varying concentrations of each osmolyte to determine the LC50. Samples are then collected from each strain exposed to control, LC50, and lowest LC50 (baseline) conditions for each osmolyte. Na^+/K^+ ATPase activity is measured through the implementation of an assay developed by McCormick (1993) that has been optimized for Daphnia tissue. Results are then analyzed with ANOVA to test for osmolyte- and strain-specific regulation of active ion transport. This study will elucidate whether Daphnia populations differ in their capacity to respond to osmolyte challenges, reflecting diverse environments in which they have evolved.

Validating Green Screen with 37 Selected Chemicals from the U.S. Chemicals Manufacturing Industry

Mengjing Yu
Sponsor: Julie Schoenung, Ph.D.
Chemical Engineering and Materials Science

Clean Production Action's (CPA's) Green Screen is a chemical hazard assessment tool that can support engineers and designers in considering environmental hazard traits of material options during design. To date, the practical application of such a benchmarking tool has not been explored for a larger range of chemicals. The goal of this research consists of using Green Screen to assign benchmark scores for the top 37 chemicals released from the U.S. chemicals manufacturing industry based on the U.S. Toxics Release Inventory (TRI). The three stages associated with this research include: 1) identification of high release chemicals from the TRI for Green Screen assessment, 2) compilation of chemical toxicity data such as hazard classifications and threshold values from various international databases, and 3) integrating the toxicity data and applying the Green Screen framework to determine benchmark scores. The larger goal of this work is to better understand the challenges and limitations of using toxicity screening tools such as Green Screen for evaluating chemicals during comparative assessments.

Early Experience and Exposure to Oxytocin May Alter Sensory Neocortex in Prairie Voles (*Microtus ochrogaster*)

Shi Min Yuan
Sponsor: Karen Bales, Ph.D.
Psychology

The present study examines differences in functional organization of the sensory neocortex based on variable early experience and exposure to oxytocin, which is a hormone involved in early parent-child bonding. Although alterations in neocortex are known to affect animal behavior, it is uncertain how the cortical field reacts to early exposure to oxytocin. This study will explore the dynamic cortex using monogamous, bi-parental prairie voles. Female and male neonates will be injected within 24 hours of birth with treatments of either isotonic saline, oxytocin (OT), or oxytocin antagonist (OTA). As adolescents, cytochrome oxidase and myelin stains will be used to determine boundaries and quantify areas of visual, auditory, and somatosensory cortex. Because OT is released naturally by gentle touch, the administration of OT is expected to increase the proportion of neocortex devoted to the primary somatosensory cortex (S1), while administration of OTA is expected to reduce the size of S1. Since prairie voles also depend greatly on audition for social behavior (mating, parenting, and interactions with offspring) we also expect to find the primary auditory cortex occupying a larger percentage of the cortical sheet following early OT treatment.

Mineralization and Protein Binding on Dye Ligand Bound Cellulose Nanofibers

Han Zhang
Sponsor: You-Lo Hsieh, Ph.D.
Textiles and Clothing

This study examines two important biological phenomena, biomineralization and protein binding, on cellulose nanofibers. This work begins with the adsorption and covalently binding of Cibacron Blue F3GA (CB) onto cellulose nanofiber fabricated from hydrolysis of electronspun cellulose acetate nanofibers. This research focuses on the subsequent CB mediated ovalbumin adsorption, and the influence of bound ovalbumin on $CaCO_3$ precipitation. Ovabumin, widely thought to regulate eggshell calcification and influence mineralization process, was assembled into single layer on CB-bound cellulose (cell) nanofiber surfaces. The presence and even coverage of CB and ovalbumin molecules on the nanofibers were evident by FTIR spectra. Results from this research contribute to the understanding of a bio-mimic process about mineralization. In addition, it suggests that the CB bound Cell nanofibrous membrane is a highly efficient ultra-high specific porous support for ovalbumin and is potentially versatile for immobilizing other proteins and as affinity membrane for proteins, such as enzymes.

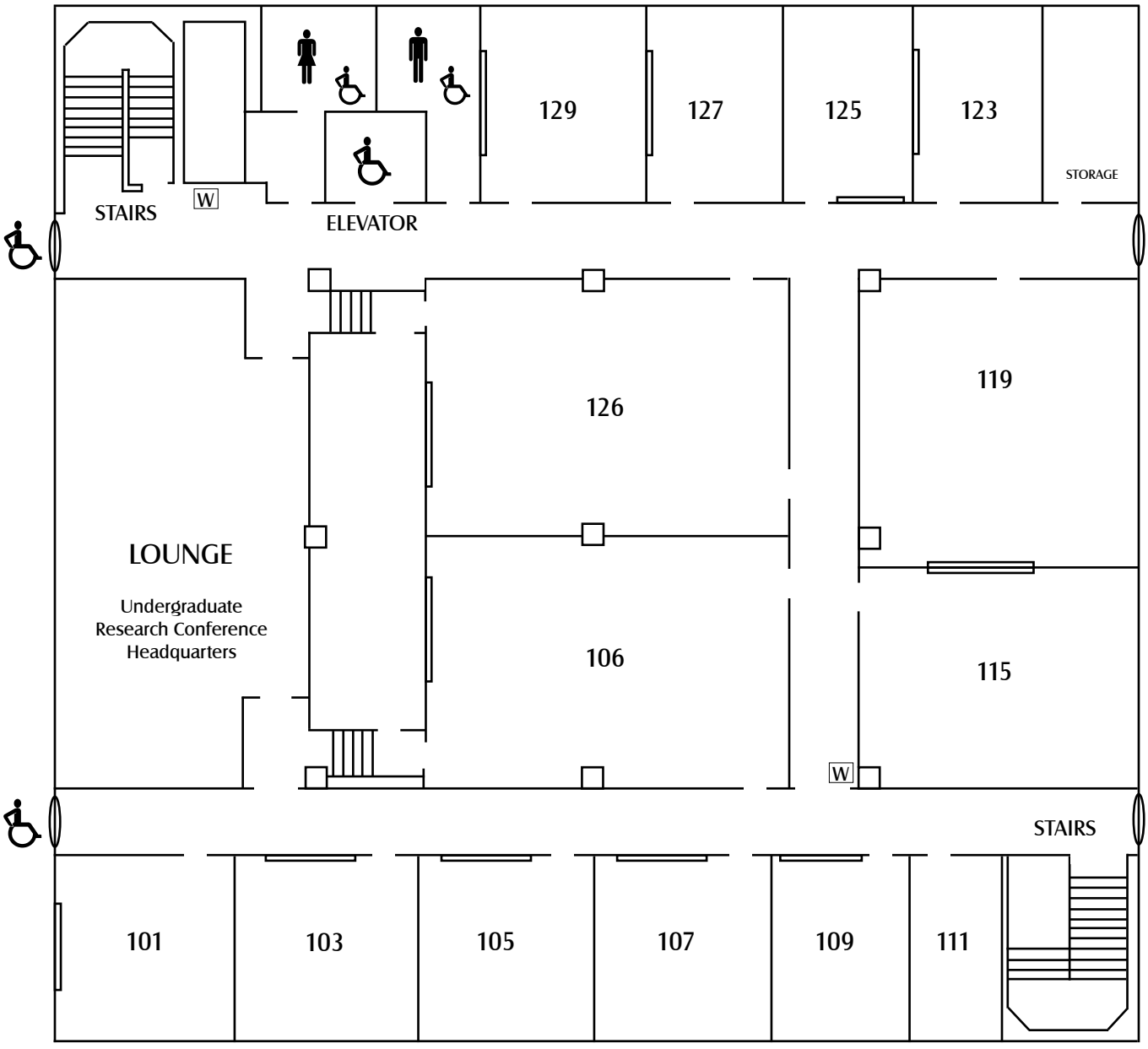
Is Biochar Good for Soil?

Xiaoming Ellen Zhang
Sponsor: Sanjai J. Parikh, Ph.D.
Land, Air, and Water Resources

Biochar is a form of charcoal derived from the pyrolysis of waste organic biomass. Soil biochar amendments have been proposed to increase soil fertility and water holding capacity, and reduce greenhouse gas emissions. In this study we investigate the physical and chemical properties of biochar that influence its reactivity in soil. Total acidity, basicity, and evaluation of corresponding chemical functional groups have been analyzed to determine the potential reactivity of biochar in soil. Examining the total acidity and basicity of biochar is fundamentally important for determining its ability to influence nutrient bioavailability for plant growth. A more acidic biochar has higher ability to absorb anions; likewise, a more basic biochar has higher cations sorption capacity. Titration methods reveal that total acidity ranges for biochars studied range from 0.07 meq/g to 1.36 meq/g and that total basicity ranges from 0.40 meq/g to 11.71 meq/g. Fourier transform infrared (FTIR) spectroscopy has been used to provide information regarding the aromaticity and functional group content of biochars. FTIR results indicate that biochars produced at higher pyrolysis temperature contain less ionizable functional groups.

WELLMAN HALL
FLOOR MAP

1st Floor



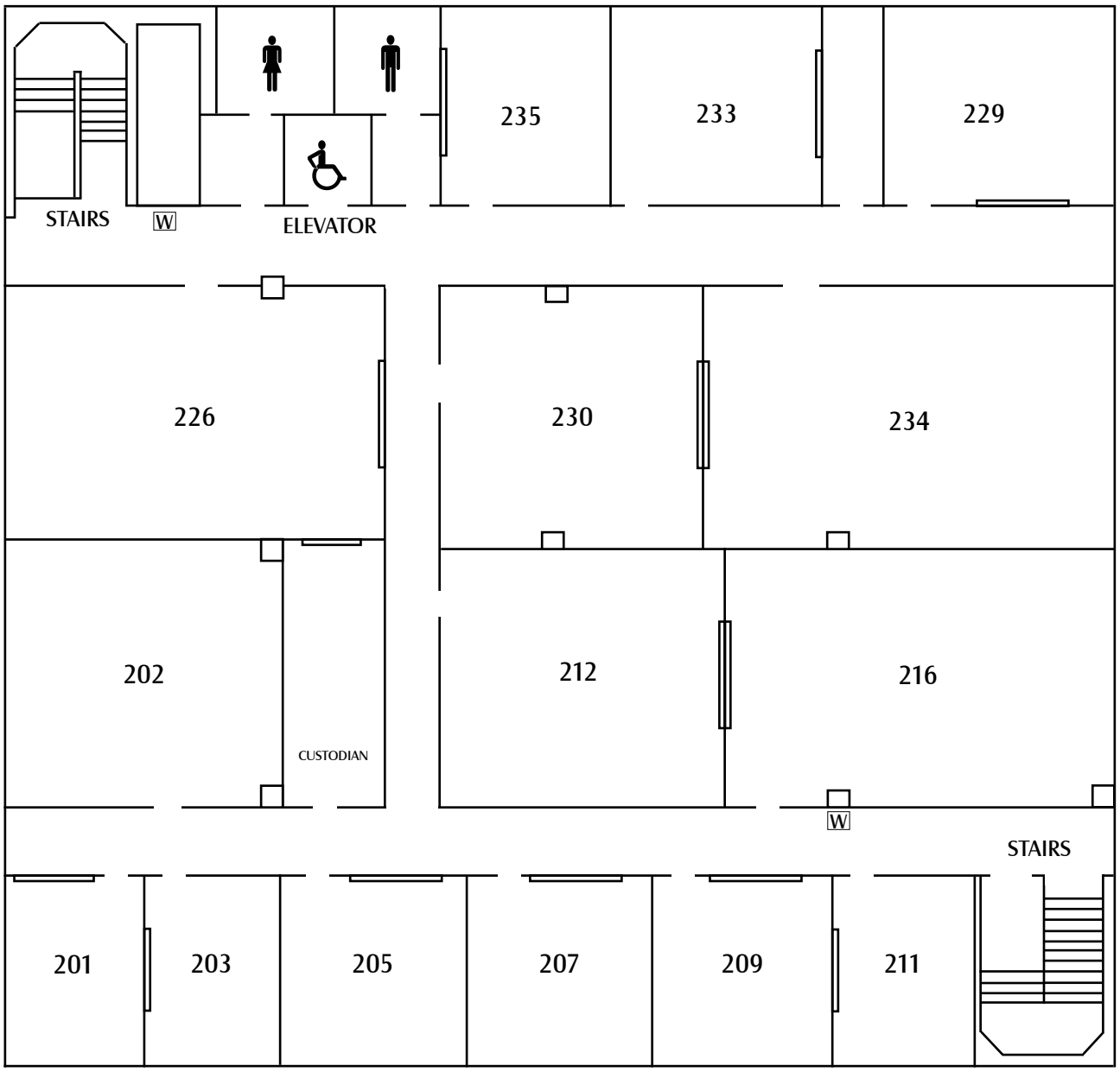
= Building Entry - Exit = Wheelchair Access W = Water

= Front of Classroom

N
W E
S

WELLMAN HALL FLOOR MAP

2nd Floor



= Building Entry - Exit = Wheelchair Access W = Water

= Front of Classroom

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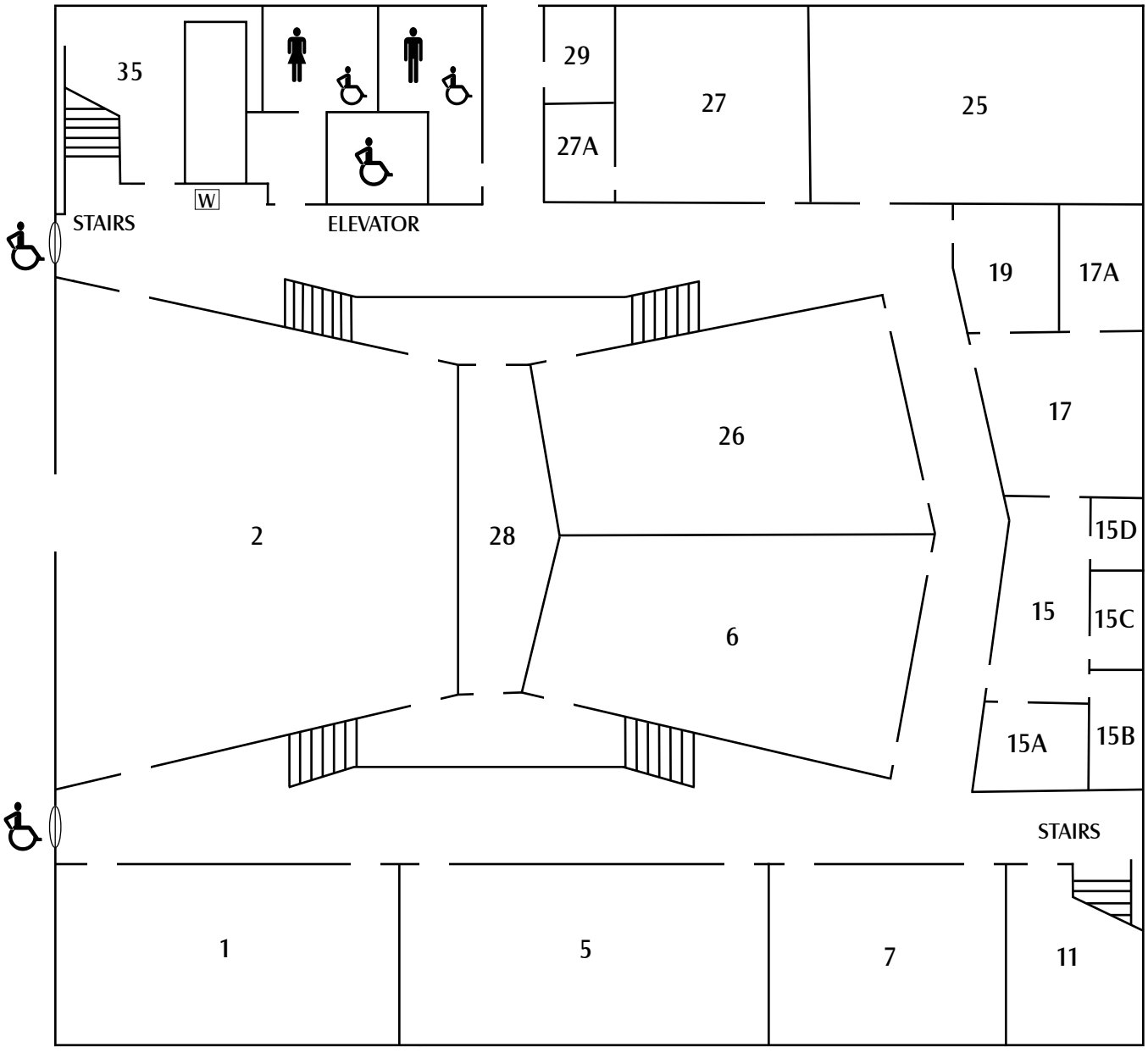
WELLMAN HALL
FLOOR MAP

Lower Level



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