

Crises of the Self in Crime Fiction

Taylor Aamot

Sponsor: Mark Jerng, Ph.D.
English

Agatha Christie shattered the expectations of Crime Fiction when she revealed the narrator of *The Murder of Roger Ackroyd* to be the killer, creating one of the biggest and most controversial twists in the history of the genre. Far from being just a clever trick, this positioning of the narrative perspective to the opposing side of the detective's work allows for a close view at elements of the human experience that were critical in forming the genre: conflicts of the self and the other such as identity, egoism, and competition. To show this, I will be balancing a close reading of *The Murder of Roger Ackroyd* with a survey of if the Detective Fiction genre, as well as contextualizing Christie's representation of crime and the criminal within psychology, criminology, and philosophy. A historicization of the genre within these contexts will reveal how they codified the manner in which Crime Fiction can represent the self. *The Murder of Roger Ackroyd* explores the connections between identity, society, and crime as they are inextricably formed in relation to each other.

Effects of cosmetics on the purple sea urchin, *Strongylocentrotus purpuratus*

Anika Agrawal

Sponsor: Gary Cherr, Ph.D.
Environmental Toxicology

Pharmaceuticals and personal care products (PPCPs) end up in the oceans in a variety of ways. It is therefore important to investigate the effects of chemicals in cosmetics as very few studies have been conducted in this field. This study examines the toxicity of four chemicals commonly found in cosmetics—bismuth oxychloride (BiOCl), magnesium silicate (MgSiO₃), silicon dioxide nanoparticles (SiO₂), and zinc oxide-bulk (ZnO)—on embryos of the purple sea urchin, *Strongylocentrotus purpuratus*. Dose response assays for larval toxicity showed significant toxicity for SiO₂ and ZnO and no significant toxicity due to BiOCl or MgSiO₃. Chemicals were also tested in combination to mimic cosmetics. Tests showed that there was an increasing trend in larval toxicity with increasing concentration of ZnO. An actual cosmetic, MAC Honey Lust Eye Shadow™, showed no dose responsive toxicity but was significantly different from controls. Spermiotoxicity assays showed that only MgSiO₃ significantly inhibited fertilization. This study also looked at the effects of SiO₂ and ZnO as chemosensitizers on the multidrug resistance pump. It found that they significantly increase the toxicity of vinblastine. These assays prove that chemicals in cosmetics are toxic to sea urchin embryos and negatively alter their ability to fertilize.

The Role of Core Replication Factors in Recombination-Associated DNA Synthesis During Meiosis

Michael Anthony Abala

Sponsor: Neil Hunter, Ph.D.
Microbiology & Molec Genetics

Meiosis is a specialized cell division wherein diploid cells produce haploid gametes. During meiosis, recombination facilitates pairing and crossing over between homologous chromosomes, ensuring their accurate segregation. Failure to recombine can cause missegregation and aneuploidy in resulting gametes, leading to infertility, miscarriage, and congenital disease. Although meiotic recombination has been extensively studied, the intermediate steps requiring de novo DNA synthesis remain poorly understood. Recombination-associated DNA synthesis (RADS) is difficult to characterize in vivo because DNA replication factors are essential for viability. Furthermore, it is difficult to separate the DNA synthesis events of recombination from meiotic chromosome replication. We are addressing these challenges in the yeast *Saccharomyces cerevisiae* through use of the auxin-inducible degron system in highly synchronized meiotic cultures, which allows us to selectively inactivate target replication factors specifically during meiotic recombination. I aim to contribute to our mechanistic understanding of meiotic RADS by determining the roles of known replication factors. Specifically, I am examining the roles of DNA ligases, flap endonucleases, and replication fork protection complex proteins. These studies will provide novel insight into the specialized set of replication factors involved in the DNA synthesis required to form joint molecule intermediates and crossover products during meiotic recombination.

Fluorescence Lifetime Imaging Combined with Intravascular Ultrasound for Cardiovascular Disease Characterization

Michael Agung

Sponsor: Laura Marcu, Ph.D.
Biomedical Engineering

This study evaluates the accuracy of a fluorescence lifetime imaging-intravascular ultrasound (FLIm-IVUS) bimodal imaging system in differentiating human coronary artery pathologies. Current diagnostic procedures, such as angiography, ultrasound, and optical coherence tomography (OCT) do not provide information on the artery biochemical composition. As a result, severe artery pathologies such as high-risk plaques cannot be properly detected. Without proper treatment, a high-risk plaque may rupture and lead to coronary thrombosis: clotting of the heart's blood supply. FLIm utilizes the autofluorescence properties of the tissue to analyze the different biochemical and structural information without the use of a contrast agent. Combined with IVUS, the system examines artery vessel composition and morphology to measure the progression and staging of artery pathology and early detection of disease. This project involves co-registering the FLIm-IVUS images of N=34 ex vivo human coronary arteries with analysis of their respective histologic sections to determine the parameters of the different artery pathologies. We aim to verify the ability of FLIm-IVUS to distinguish the different coronary artery diseases with a sensitivity and specificity of at least 90%. After FDA approval, FLIm-IVUS could be used in clinical trials to monitor the progression of artery disease and/or drug therapy.

The Role of Religiosity in Depressive Symptoms for Breast Cancer Patients

Rifa Akanda

Sponsor: Patricia Roberson, Ph.D.
Human Ecology

By 2018, there will be an estimated 266,120 women newly diagnosed with invasive breast cancer in the United States alone. About 50 percent of the women with breast cancer were diagnosed with depression and anxiety within the first year. There are several factors that may mitigate the high rate of depression. First, it is found that patients with breast cancer who report high religiosity have a significantly lower prevalence of depression. Though research has also shown that, in general, higher levels of social support can contribute to a longer lifespan, research directly showing associations between marital support when facing depression has not been studied extensively. However, it remains unclear how marital status may interact with religiosity on the number of depressive symptoms among breast cancer patients. Specifically, this present study will consider how spirituality and marital status interact to affect a number of depressive symptoms in patients that have been diagnosed with breast cancer.

Results and discussion will be presented in the poster.

Taxonomic Classification of Yeast Using Amplicon Sequencing by Combining UNITE and DITSY Databases

Samir Akre

Sponsor: David Mills, Ph.D.
Food Science & Technology

Internal Transcribed Spacer (ITS) sequencing is a current method for describing fungi in complex communities. A challenge in classifying yeasts from ITS sequencing is the database used for fungal classification, UNITE, does not focus on yeast taxonomy. A second database, DITSY, focuses on yeasts, but does not include enough information on non-yeasts to ensure accurate classification. This project compares the accuracy of UNITE, DITSY, and a hybrid UNITE-DITSY database at classifying ITS sequences. A mock community ITS sequences dominated by known yeasts was processed using Deblur in QIIME2, and taxonomy assigned with a Bayesian classifier trained with either UNITE, DITSY, or the hybrid database. The classifications were compared to expected frequencies in mock communities at each taxonomic level using the Bray-Curtis distance with 1 indicating poor performance and 0 indicating perfect performance. The Bray-Curtis distribution revealed that at the family level UNITE, DITSY and the hybrid database trained classifiers performed with a mean Bray-Curtis distance of 0.861, 0.878, and 0.734 respectively. The hybrid UNITE-DITSY database produced more accurate classifications of fungi in these tests, suggesting that it will be more effective than the current UNITE database when studying fungal communities expected to contain yeasts.

Is Adipocyte Viability Affected by Temperature During Lipoaspirate Centrifugation?

Shabana Akramy

Sponsor: David Sahar, M.D.
MED: Surgery

Centrifugation is utilized to concentrate adipocytes from a lipoaspirate during fat grafting, which can cause mechanical damage to the cells. Low temperatures can increase the integrity of the cell membranes and possibly reduce the resistance to mechanical force. This study aims to explore the effect of various temperatures during lipoaspirate centrifugation to the viability of adipocytes. Institutional Review Board approval was obtained prior to commencement of this study. Lipoaspirates from six healthy women were harvested and each sample was divided into three groups at different temperatures, i.e. Group 1, at 4?; Group 2 at 25?; Group 3 at 37?. Hematoxylin and eosin staining, immunofluorescence, glycerol-3-phosphate dehydrogenase (G3PDH) activity and MTS assays were utilized to evaluate function and viability. Group 1 retained fewer intact adipocytes significantly ($p < 0.05$) compared to Group 2 and 3, which did not differ significantly. The level of glycerol-3-phosphatase dehydrogenase absorbance value was significantly higher in group 2 compared to the others. There was no significant difference among three groups by MTS assay. Thus, 4? and 37? did not protect the viability or integrity of adipocytes during centrifugation. The group that underwent centrifugation at 25? had the best viability.

Maternal Depression and Mother-Infant Interactions in Mexican Origin Families

Cynthia Alvarado-Martinez

Sponsor: Leah Hibbel, Ph.D.
Human Ecology

Detrimental effects of maternal depression and parenting stress on infant development have been established, however no study has focused solely on Mexican origin (MO) mothers and infants to examine the relationship between maternal depression, parenting stress, and infant sleep in this population (Bagner, Pettit, Lewinsohn, & Seeley, 2010; Gelfand, Teti, & Fox, 1992). We are assessing 25 mother-infant dyads (mothers' age = 18 to 25 years; infants' age = 6 months) from the California Babies Project. Sleep was objectively and subjectively recorded via actigraphy (MicroMotion Logger, AMI) and diary for 8 nights. Maternal depressive symptoms were assessed using the Center for Epidemiologic Studies Depression Scale (Radloff, 1977). Parenting stress was assessed using the Parental Stress Index Questionnaire (Abidin, 1990). We are currently coding sleep data. More than a quarter (28 percent) of the mothers were at-risk for clinical depression. Additionally, 28 percent of the mothers were found to be experiencing clinically significant parenting stress. Higher depressive symptoms were associated with increased parenting stress ($r = .485$, $p = .014$) and increased parental distress ($r = 0.620$, $p = 0.001$). Once sleep data are coded, future analyses will examine the relationships among maternal depression, parenting stress, and infant sleep.

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Gut Microbe-derived Microparticles for Controlling the Immune System

Kenneth Alvarez

Sponsor: Jamal Lewis, Ph.D.
Biomedical Engineering

According to the NIH, more than 23.5 million Americans are affected by an autoimmune disease, an illness that occurs when the body tissues are attacked by its own immune system (e.g. Rheumatoid Arthritis). Current treatments involve immunosuppressive medications which weaken the immune system, leaving the patient susceptible to infectious diseases. Evidently, there is a need for new drugs that can specifically block autoimmune responses, whilst leaving immunity intact. One potential candidate is Polysaccharide A (PSA), which has shown capability to induce Type 1 regulatory T-cells (Tr1s) in germ free mice. Our hypothesis is that PSA microparticles (MPs) can act as a regulatory agent and induce the activation of Tr1s by stimulating immature dendritic cells (iDC). An increase in Tr1 cells can help to curb autoreactive responses. Herein, PSA has been extracted from a gut microbe, *Bacteroides Fragilis*, and fabricated into MPs (diameter = 500 – 1000 nm), using a desolvation method. Flow cytometry data showed that CD4+ T-cells cultured with PSA-pretreated iDCs displayed the highest percentage of Tr1s, and secreted the highest level of IL-10, an anti-inflammatory cytokine. Future work will compare the efficacy of PSA microparticles with that of soluble PSA.

Exploring Student Interactions with Graduate and Undergraduate Teaching Assistants in Chemistry Laboratories

Xavier Antoine-Goeas

Sponsor: Ozcan Gulacar, Ph.D.
Chemistry

Beginning in Fall 2017, the Chemistry Department at UC Davis started a pilot program through which undergraduate teaching assistants, formally known as emerging scholars (ES), have been working with graduate teaching assistants (TA) in laboratory settings. In order to observe and study the differences in student interactions with the TA's and the ES's, every TA and ES was asked to audio record their conversations during two lab sessions. After the audio data were collected, they were first transcribed and student interactions with the lab instructors were coded using Laboratory Observation Protocol for Undergraduate STEM (LOPUS). Findings of this study will reveal whether students are more comfortable approaching TA's or ES's and how the teaching styles may vary between the two lab instructors. Student inquiries and TA/ES responses will be carefully examined to better understand the instructional styles in the labs. These observations and analyses will reveal the efficacy of the Emerging Scholars program and provide the guidelines to enhance student learning experiences. The results will also be used to assess the overall success of the Emerging Scholars program and suggest improvements to enhance the role of ES's in the labs.

Improving Highway Work Zone Safety

Meysel Amaya Bautista

Sponsor: Bahram Ravani, Ph.D.
Mechanical & Aerospace Engr

Everyday highway workers risk their lives due to working in close proximity to high-speed traffic. According to the Federal Highway Administration work zone accidents statistics, annually there are approximately 84,721 crashes, 22,276 injuries, and 595 traveler and worker deaths in such accidents. The purpose of this research is to analyze traffic collisions in California highways work zones, identify contributory factors, and evaluating viable solutions that can increase workers' safety. Data from a total of 50 randomly selected accident reports from accidents in California in 2010 is used as a basis for this research. The accident reconstruction PC-Crash will be used to simulate these 50 accidents. This will allow identification of collisions factors as well as outcomes in these accidents. The use of simulation would allow changing the initial conditions such as vehicle speeds and time duration of braking as well as influence of mitigation methods like use of barriers and advisory signs on accident avoidance. The findings will be aimed at establishing possible mitigation methods that could prevent vehicles from intruding into work ones.

Preserving Cultural Identity Through the Collective: A Lacanian Perspective on Reconciling the Fractured Asian-American Identity

Abigail Aprejilio

Sponsor: Erika Strandjord, Ph.D.
University Writing Program

The Trump administration's exacerbation of anti-immigrant sentiment makes the understanding of immigration reform and its impact on an immigrant's fractured sense of identity more important. Asian Americans usually experience fractured identities resulting from being stereotyped as perpetual foreigners by western society. Studies of Asian-American behavior have argued that cultural dilution arises from how these minorities prioritize Asian American visibility by building a cultural collective with westerners (assimilation) or with other Asian Americans (panethnic aggregation). I intervene in this conversation by applying Lacan's theory of the "mirror stage" to three Asian-American creative nonfiction pieces: "Fish Maw and Crabmeat Soup," "Why I Write in English," and "Coffee Diplomacy." In doing so, I address how an individual reconciles their split identity by understanding their unique cultural background through its relation to the collective, a process vital to striving towards the idealized version of oneself formulated during the "mirror stage." Furthermore, a Lacanian examination of the cultural collective and its effects on an individual reveals how the visibility of collective cultural identities in the public sphere will compel western society to examine other cultures' influence on the acquisition of an idealized self, thus allowing marginalized communities to have a stronger voice.

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Bilingual Education: Less Fallout from High-School Dropouts

Romae-Anne Aquino

Sponsor: Travis Baker, Ph.D.
UC Center Sacramento

In an era where multilingualism is essential to global markets, international relations, and diplomacy, it is imperative that American students reach a proficient level of bilingualism in order to further strengthen the United States as a successful competitor to other nations. By examining the effects of bilingual education in California, a state that would rank the sixth largest economy in the world, my findings demonstrate plausible success for the increase of bilingual education programs in the United States. My research examines the correlation between high school dropout rates and bilingual education in California public schools. The data show a general trend of dropout rates among English Language Learners (ELL students) decreasing. The concurrent increase in funding per pupil for ELL students over the same timeframe is a likely mechanism for the finding. Although several studies have demonstrated the effectiveness of bilingual education, my finding of exponentially rising academic success among California pupils may contribute to advancing the global competitiveness of the United States.

Characterization of a polymorphic region of MSH3, a mismatch repair protein associated with colorectal cancer

Bianca Arao

Sponsor: Kenneth Hilt, Ph.D.
Molecular & Cellular Bio

Elevated Microsatellite Alterations at Selected Tetranucleotide repeats (EMAST) is a genetic signature associated with metastasis and recurrence in colorectal cancers. It is caused by a deficiency in MSH3, a DNA mismatch repair protein that contains a bona fide nuclear localization signal (NLS). The NLS, along with two export signals, allow for MSH3 cytosol-to-nucleus shuttling under cellular stress. The pro-inflammatory cytokine Interleukin-6 (IL-6) alters MSH3 localization, causing defects in DNA mismatch repair. Shuttling of MSH3 appears to be affected by a polymorphism near the NLS that contains a deletion of 27 base pairs ($\Delta 27$ bp), which increases the cytosolic presence of MSH3, thereby increasing EMAST. Our aim is to explore how specific sequences within the $\Delta 27$ bp polymorphism affect MSH3 shuttling function. The polymorphic region has two regions, and we hypothesize they are critical in regulating the NLS function and have different roles in this regulation. By PCR mutagenesis and molecular cloning, we successfully generated reporter constructs of the peri-NLS MSH3 region expressing three different deletions. Continuing studies will examine the subcellular location of MSH3 for each construct, and evaluate it through immunofluorescence microscopy (IFM), using an MSH3-antibody in cells with and without IL-6 treatment.

Exploring Material Balance Principles Through Interactive Simulations

Jenny Lyn Arabit

Sponsor: Brian Higgins, Ph.D.
Chemical Engineering

The concept of material balances is central for designing new chemical processes or analyzing existing ones. Chemical engineering students are required to take a material balances course to build a foundation for understanding all the other process engineering concepts. The objective of our research project is to create and to publish a free interactive/multimedia eBook that illustrates the key concepts of material balances. We will develop the scientific demonstrations using Wolfram Mathematica software and, by utilizing a ScreenFlow software, we will capture a voice overlay of an evolving computer screen that shows the interactive features of Wolfram demonstrations as a movie. This format, which is compatible with an HTML5 widget, is supported by Apple iBook, thus, allowing us to add sophisticated demonstrations that illustrate the principles of material balances. We are using iBook as our platform because it allows us to input widgets that can easily access the Wolfram demonstration movie that corresponds to a specific chapter. We hope to further develop the interactive book by utilizing users' feedback and collaborating with experts in the field of education. In the future, we hope to offer this textbook option to the introductory mass balance course, ECH51, at UC Davis.

The role of the Arabidopsis receptor like kinase, FER, in coronatine-mediated plant susceptibility

Juan Araujo

Sponsor: Maëli Melotto, Ph.D.
Plant Sciences

Plants rely on a critical network of proteins to perceive and respond to pathogen invaders. The membrane receptor-like kinase FERONIA (FER), a member of the Catharanthus roseus receptor like kinase1-like (CrRLK1L) family, regulates plant immunity by facilitating complex formation of the immune receptor kinases EF-TU RECEPTOR (EFR) and FLAGELLIN-SENSING 2 (FLS2) with their co-receptor BRASSINOSTEROID INSENSITIVE 1-ASSOCIATED KINASE1 (BAK1). This complex formation initiates immune signaling. Interestingly, we found that FER also contributes to stomatal re-opening and susceptibility to *Pseudomonas syringae* pv. tomato (Pst) DC3000 in Arabidopsis. Pst DC3000 produces a variety of virulence factors such as phytotoxin coronatine (COR). COR re-opens stomata, promotes bacterial growth and the spread of the disease to uninfected host tissue. Thus, we tested whether FER plays a role in coronatine-mediated plant susceptibility using the genetic mutants *fer-4*, *fer-5* and two bacterial strains Pst DC300 (COR+) and Pst DC3118 (COR-). These findings will be further discussed during the presentation.

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Sponsor: Maeli Melotto, Ph.D.
Plant Sciences

Plants rely on a critical network of proteins to perceive and respond to pathogen invaders. The membrane receptor-like kinase FERONIA (FER), a member of the Catharanthus roseus receptor like kinase1-like (CrRLK1L) family, regulates plant immunity by facilitating complex formation of the immune receptor kinases EF-TU RECEPTOR (EFR) and FLAGELLIN-SENSING 2 (FLS2) with their co-receptor BRASSINOSTEROID INSENSITIVE 1-ASSOCIATED KINASE1 (BAK1). This complex formation initiates immune signaling. Interestingly, we found that FER also contributes to stomatal re-opening and susceptibility to *Pseudomonas syringae* pv. tomato (Pst) DC3000 in Arabidopsis. Pst DC3000 produces a variety of virulence factors such as phytotoxin coronatine (COR). COR re-opens stomata, promotes bacterial growth and the spread of the disease to uninfected host tissue. Thus, we tested whether FER plays a role in coronatine-mediated plant susceptibility using the genetic mutants *fer-4*, *fer-5* and two bacterial strains Pst DC300 (COR+) and Pst DC3118 (COR-). These findings will be further discussed during the presentation.

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