Education

Undergraduate Opportunities
K-12 Science Activities
For Teachers
Education Contacts
News

California Alliance for Minority Participation

California Alliance for Minority Participation (CAMP)
Summer 2009 - Student Projects

Student Major	Mentor	Faculty Sponsor	Department	Student Project
Maria Arenas Hydrology	Jiana ten Brinke	Ed Keller	Earth Sciences	EFFECTS OF ARUNDO DONAX ON FLOODPLAIN PROCESSES OF BRAIDED RIVERS
Brian McVerry Biochemistry	Yanika Schneider	Guillermo Bazan	Department of Chemistry and Biochemistry	SYNTHESIS AND CHARACTERIZATION OF POLY(ETHYLENE)-GRAFT-POLY(TERT-BUTYL ACRYLATE) MATERIALS
Andrés Muñoz Mechanical Engineering	Justin Cochran	Michael Chabinyc	Materials Department	COATING PROCESSES FOR ORGANIC PHOTOVOLTAIC DEVICES
Joshua Murillo Physics	Danielle Schultz	Elizabeth Gwinn	Physics	ALTERING MOBILITY OF AG:DNA HAIRPINS THROUGH HYBRIDIZATION
Amanuel Negash Jason Martyn	Jason Martyn	Rouslan Krechetnikov	Mechanical Engineering	EXPERIMENTAL AND THEORETICAL STUDY OF INSTABILITIES OF LIQUID RIMS
Manuel A. Olmedo Physics	Joel Sander	Harry Nelson	Physics	ENERGY CALIBRATION OF NEUTRON MULTIPLICITY METER DETECTOR
Rosie Quiroz Biological Sciences	Eileen Hamilton	Eduardo Orias	Molecular Cellular and Developmental	CHROMOSOME BREAKAGE SEQUENCE MAPPING IN TETRAHYMENA THERMOPHILA
Sandra S. Roman Environmental Studies	Leah Dudley	Susan Mazer	Ecology, Evolution and Marine Biology	MATING SYSTEMS EVOLUTION: CORRELATING PHYSIOLOGY WITH FITNESS
Jesse Vasquez Biological	Eileen Hamilton	Eduardo Orias	Molecular Cellular and Developmental Biology	MAPPING A GENE IN THE REGULATED EXOCYTOSIS MUTANT STRAIN SB281 TO THE MICRONUCLEUS AND

Sciences			Department	MACRONUCLEUS
Jessica Zaragoza Biopsychology	Alexandra Chambers	Russell Revlin	Psychology Department	COUNTERFACTUAL REASONING IN MEDICINE

Return to the CAMP homepage

Maria's Project Page - CAMP Summer 2009

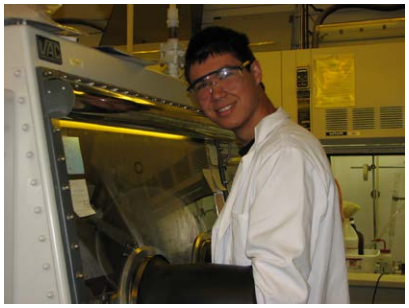
Intern: Maria Arenas, Hydrology
Mentor: Jiana ten Brinke
Faculty Supervisor: Ed Keller
Department: Earth Sciences

EFFECTS OF ARUNDO DONAX ON FLOODPLAIN PROCESSES OF BRAIDED RIVERS

Arundo donax, a perennial reed-like grass native to the freshwaters of East Asia, has become an invasive plant in coastal rivers in North America (Bell, 1997). A. donax has become a large threat to rivers in Southern California, such as the Santa Ana and the Santa Clara, which are both braided, sandy-gravel rivers for most their length. A. donax creates a monoculture in the riparian and channel areas, posing a threat to native and endangered species in the river corridor (Bell, 1997) and potentially altering fluvial process. It is hypothesized that A. donax may increase the flooding hazard in areas of the floodplain where it is dominant by growing denser and occupying more space in the floodplain and channel than native vegetation. The purpose of this project is to expand understanding of the role of vegetation in fluvial processes, with a focus on the effects of A. donax. To study the effect of A. donax versus native vegetation on floodplain processes of braided rivers, we will complete a study in the Santa Clara River, Ventura County, in mature native and A. donax stands of the floodplain. Four transects, two in native stands and two in A. donax stands, will be conducted in the floodplain of the river where hydrologic processes are similar. Soil samples, collected at intervals along the transect, will be analyzed for texture to determine whether A. donax is increasing the sediment deposition on the floodplain during overbank flows. Historic aerial photographs of the river's floodplain will be analyzed using ESRI's ArcGIS to map floodplain development. A combination of surveying with a stadia rod and hand level and LiDAR data will be used to construct a topographic profile along the transects.

Return to the CAMP 2009 project list

Brian's Project Page - CAMP Summer 2009



Intern: Brian McVerry, Biochemistry
Mentor: Yanika Schneider
Faculty Supervisor: Guillermo Bazan
Department: Department of Chemistry and Biochemistry

SYNTHESIS AND CHARACTERIZATION OF POLY(ETHYLENE)-GRAFT-POLY(TERT-BUTYL ACRYLATE) MATERIALS

Polyethylene is one of the most widely produced polymers due to its durability, versatility, and cost effectiveness. However, because it is non-polar, polyethylene cannot be bound, adhered, or coated to polar materials. Our aim with this project is to create a new material that retains the positive aspects of polyethylene, while containing functionality that will allow it to be compatible with polar materials. First, polyethylene macroinitiators were prepared using an ?-iminocarboxamide Ni(II) catalyst that copolymerized ethylene and norbornen-2-yl-2-bromo-2-methylpropanoate, an initiating monomer or inimer. While the temperature and ethylene pressure were kept constant, the concentration of inimer and duration of the polymerization were varied to produce a library of novel macroinitiators. Next, tert-butyl acrylate was grafted from the macroinitiators using atom transfer radical polymerization. The incorporation of tert-butyl acrylate was confirmed by nuclear magnetic resonance spectroscopy, while the molecular weight distributions was assessed using gel permeation chromatography. Finally, to increase the polarity of the graft copolymers, tert-butyl acrylate functionalities were converted into acrylic acid using both chemical and thermal means. Contact angle measurements were performed to observe a change in surface properties of graft materials. Consequently, we were successful in creating a hybrid polyethylene material that would be compatible with polar materials.

Return to the CAMP 2009 project list

Andrés' Project Page - CAMP Summer 2009

Intern: Andrés Muñoz, Mechanical Engineering
Mentor: Justin Cochranr
Faculty Supervisor: Michael Chabinyc
Department: Materials Department

COATING PROCESSES FOR ORGANIC PHOTOVOLTAIC DEVICES

Organic photovoltaic cells represent a potentially low cost solution to the need for generation of electrical power from solar radiation. These photovoltaic devices currently achieve power conversion efficiencies of approximately 5% whereas efficiencies of greater than 10% are desirable for large-scale adoption of solar energy conversion. Currently, the most efficient organic photovoltaic cells are fabricated as bulk heterojunctions. A bulk heterojunction comprises a phase-separated blend of a light absorbing organic polymer and an electron accepting (or donating) material. Because the exciton only diffuses a short distance, typically ~5 nm, the phase-separated domains must be on the order of 10 nm. Control over nanoscale phase separation in blends of semiconducting polymers has been difficult to achieve due to the complex phase behavior. Current coating methods are unable to control nanoscale domains and they lack the ability to modulate and control a wide range of coating parameters. Blade coating is a promising method to fabricate polymeric photovoltaic devices. Unlike spin coating, the substrate temperature and solvent environment can be controlled easily. Additionally, the blade can be nanopatterend which may enable nanoscale control over phase segregation. Relatively little, however, has been done to examine the phase separation process of semiconducting polymers using this technique. The first step towards studying the blade coating method is to construct an instrument that enables temperature control of the substrate. The project will comprise designing the motion control system and heating stage followed by characterizing the resulting photovoltaic devices fabricated with the system.

Return to the CAMP 2009 project list

Joshua's Project Page - CAMP Summer 2009

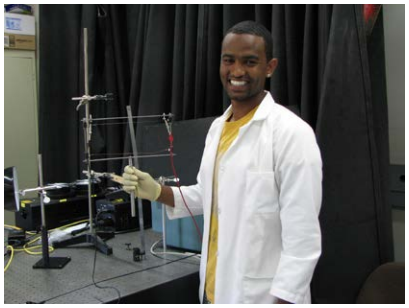
Intern: Joshua Murillo, Physics
Mentor: Danielle Schultz
Faculty Supervisor: Elizabeth Gwinn
Department: Physics

ALTERING MOBILITY OF AG:DNA HAIRPINS THROUGH HYBRIDIZATION

Recent experimental work has shown that short, synthetic DNA strands stabilize clusters of just a few silver (Ag) atoms. These Ag:DNA molecules are very interesting because they exhibit fluorescence at visible wavelengths that depend on the choice of the DNA strand; and because they are much more photo-stable, and much smaller, than the organic molecules traditionally used in fluorescence imaging. The main goal of this project is to establish whether hybridizing DNA species that already fluoresce with their complimentary strands will destroy the fluorophors. We hypothesize that we can use strand hybridization as a tool to alter molecular mobility in solution, making the different fluorophors easier to separate. We will use a combination of fluorescence-spectroscopy, mass-spectroscopy and gel-electrophoresis to test this hypothesis. Preliminary experimental results show that mixing complimentary strands with fluorescent Ag:DNA solutions does not alter the species photo-physical properties; additionally, absorbance measurements indicate that the complimentary strands are indeed hybridizing with the fluorescent Ag:DNA species. Mass spectroscopy will be used to confirm the hybridization of the complimentary strands. Finally, electrophoresis will be used to observe the relative mobility's of bare DNA, Ag:DNA, and hybridized Ag:DNA. These experiments will contribute to a better understanding of our fluorophors and indicate whether the use of hybridization is good technique for altering the molecule's mobility in a gel-electrophoresis experiment. We hope this work will assist us, as well as others, in characterizing the properties of fluorescent DNA species for work in future nanotechnological materials.

Return to the CAMP 2009 project list

Amanuel's Project Page - CAMP Summer 2009



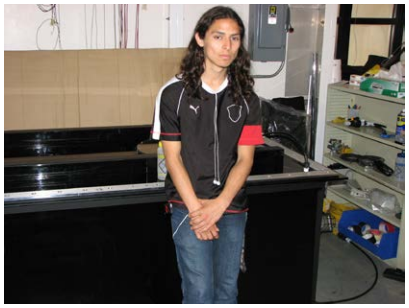
Intern: Amanuel Negash, Mechanical Engineering
Mentor: Jason Martyn
Faculty Supervisor: Rouslan Krechetnikov
Department: Mechanical Engineering

EXPERIMENTAL AND THEORETICAL STUDY OF INSTABILITIES OF LIQUID RIMS

The study of liquid rim instabilities is important for applications, as they lead to the phenomena of fluid atomization and liquid sheet disintegration. The ultimate goal of this project is to understand the effects of the film properties, rupture, acceleration, and retraction on the development of these instabilities. In order to study these instabilities, it is necessary to design the experimental set-up, which is able to release the film from its edge and to detect a regime when it experiences instability, various challenges and the physics involved in this process. The present experimental setup consists of a high speed camera recording a soap film attached to a wire frame; the film is heat released by passing a current through the high resistant wire. Among the challenges is to release the film uniformly from the wire instead of from a point, which is a more common way of the film rupture. Overcoming this difficulty involves looking into the physics of various processes and making experimental measurements to verify the theoretical intuition.

Return to the CAMP 2009 project list

Manuel's Project Page - CAMP Summer 2009



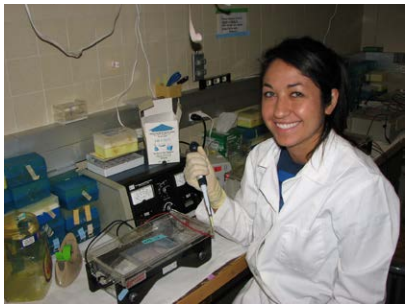
Intern: Manuel A. Olmedo, Physics
Mentor: Joel Sander
Faculty Supervisor: Harry Nelson
Department: Physics

ENERGY CALIBRATION OF NEUTRON MULTIPLICITY METER DETECTOR

The existence of dark matter has been confirmed by experiment, yet its composition remains a mystery. The Cryogenic Search for Dark Matter (CDMS) is one of many experiments designed to directly detect dark matter. In particular, the CDMS experiment strives to discover a theoretically well-motivated class of particles termed Weakly Interactive Massive Particles (WIMPs). One challenge these experiments face is the difficulty in distinguishing neutron interactions from WIMP interactions. To decrease the rate of neutron interactions, dark matter experiments are operated deep underground and employ neutron shielding. However high energy neutrons, produced by cosmic ray showers, are highly penetrating and reach the detector; the underground flux is not well known. The Neutron Multiplicity Meter (NMM) is designed to measure the flux of these high energy neutrons in an underground laboratory. In this poster, I will describe the structure of the NMM, its operation, the physical steps involved in detecting a high energy neutron and its energy calibration.

Return to the CAMP 2009 project list

Rosie's Project Page - CAMP Summer 2009



Intern: Rosie Quiroz, Biological Sciences
Mentor: JEileen Hamilton
Faculty Supervisor: Eduardo Orias
Department: Molecular Cellular and Developmental Biology Department

CHROMOSOME BREAKAGE SEQUENCE MAPPING IN TETRAHYMENA THERMOPHILA

Tetrahymena thermophila is a freshwater single-celled organism. It is a valuable experimental model system for fundamental and biomedical research. Each cell has two nuclei, a small, germline micronucleus (MIC) and a large somatic macronucleus (MAC). The germline MIC has five pairs of chromosomes. In the somatic MAC, the MIC chromosomes have been fragmented in a site-specific way into 181 macronuclear chromosomes. Fragmentation occurs at highly conserved chromosome breakage sequences (CBS). The sequence of the MAC genome is available and has been assembled into 181 sequence scaffolds, each representing a MAC chromosome. The MIC genome has been recently partially sequenced at the Joint Genome Institute (JGI) and putative new CBS were identified. The goal of this project is to map each putative CBS to a MIC chromosome arm. To accomplish this, I designed PCR primers flanking each CBS. Putative CBS were mapped to MIC chromosome arm using PCR and template DNA from a panel of nullisomic strains, which lack both copies of specific MIC chromosome(s) or MIC chromosome arm(s). Using this approach, I have already confirmed and mapped 12 new CBS. The results also identified a MAC chromosome previously assigned to the wrong MIC chromosome arm. Furthermore, I identified a polymorphism adjacent to CBS 1R-D and have mapped it more finely to MIC linkage group 1R-GAL. These data will help align the MAC chromosome scaffolds in their correct pre-fragmentation order and orientation along the MIC genome -- one of the final goals of the Tetrahymena thermophila genome project.

Return to the CAMP 2009 project list

Sandra's Project Page - CAMP Summer 2009

Intern: Sandra S. Roman, Environmental Studies
Mentor: Leah Dudley
Faculty Supervisor: Susan Mazer
Department: Ecology, Evolution and Marine Biology

MATING SYSTEMS EVOLUTION: CORRELATING PHYSIOLOGY WITH FITNESS

There are many types of mating systems, we focus on two: outcrossing and self-fertilization. There are two main hypotheses explaining self fertilization evolving from outcrossing. First, the reproductive assurance hypothesis, states that selfing evolved from poor pollinator services. Second, the drought avoidance hypothesis, states that selfing evolved as a byproduct of selection to avoid desiccation. We will explore the drought avoidance hypothesis. Some drought avoidance traits are earlier flowering time, shorter life span, and smaller flowers. Clarkia, a California wild flower is known to have evolved selfing taxa from outcrossing taxa multiple times. We investigate drought avoidant traits in two outcrossing taxa, Clarkia xantiana ssp xantiana and Clarkia unguiculata in plants growing at the extremes of their ranges where they are found sympatrically with their self-fertilizing sister taxon. We predict that there would be a correlation between physiological traits, which may enable plants to avoid drought, and fitness.. In the field, we measured photosynthetic and transpiration rates by using an infared gas analyzer. Using the ratio between photosynthesis and transpiration, we estimated water use efficiency. Fitness was measured by fruit set, (bud/flower production). We saw no significant correlations for the outcrossing species Clarkia xantiana ssp xantiana, but we found trends supporting our hypotheses. We detected a positive trend between photosynthetic rates and fitness, and a positive trend for transpiration rates and fitness. We found a negative trend between water use efficiency and fitness. The non-significant correlations could be due to a small sample size (n=103). These trends agree with our drought avoidance hypothesis; although, other factors not included in the current correlations which may help to explain some of the variation between physiological traits and fitness.

Return to the CAMP 2009 project list

Jesse's Project Page - CAMP Summer 2009

Intern: Jesse Vasquez, Biological Sciences
Mentor: Eileen Hamilton
Faculty Supervisor: Eduardo Orias
Department: Ecology, Evolution and Marine Biology

MAPPING A GENE IN THE REGULATED EXOCYTOSIS MUTANT STRAIN SB281 TO THE MICRONUCLEUS AND MACRONUCLEUS

Regulated exocytosis is a conserved, eukaryotic, biological process that allows a cell to simultaneously release proteins from secretory vesicles into the extra cellular space in response to a stimulus. Tetrahymena thermophila, a unicellular eukaryote, exhibits unique physiological features that make this organism an excellent model system for the study of regulated secretion and genetic analysis. Tetrahymena is nuclear dimorphic, i.e., each cell has two different nuclei: the macronucleus (MAC) and the micronucleus (MIC). The objective of this project is to genetically map the mutant gene of an exocytosis minus mutant strain of Tetrahymena thermophila (SB281) to a finer region on MIC chromosome 4L and to a MAC chromosome. To do the fine mapping, I am testing a panel of meiotic segregants for genetic linkage of known DNA polymorphisms and the mutant gene. I have found no genetic linkage among eight DNA polymorphism tested, thus, eliminating these regions as possible locations of the mutant gene. Additional polymorphisms will be tested. In order to map the mutant gene to a MAC chromosome, I made a panel of terminal assorters; panel members will be tested for coassortment of the exocytosis phenotype with mapped DNA polymorphisms. The ultimate goal is to identify putative mutant genes on the identified MAC chromosome and then sequence those genes from the mutant strain to see if they contain a mutation. Identifying the gene of regulated exocytosis minus mutant in Tetrahymena thermophila is important for future studies on related secretory pathways and human physiology.

Return to the CAMP 2009 project list

Jessica's Project Page - CAMP Summer 2009

Intern: Jessica Zaragoza, Biopsychology
Mentor: Alexandra Chambers
Faculty Supervisor: Russell Revlin
Department: Psychology Department

COUNTERFACTUAL REASONING IN MEDICINE

Belief revision has been studied using many media, all of which yield slightly different results. Belief revision and counterfactual reasoning in particular, have been studied using belief contravening problems in both paper-and-pencil-tasks as well as modal logic problems both with and without pictures. Seemingly negligible variables, such as the presence of a picture representing the statements, affect the preferred solution. This study examines whether prior bias has any bearing on which answer set of a belief contravening problem people prefer. Problems will be presented either in the format of a combining (modus tollens) or rending (modus ponens) problem. Students read a set of statements regarding a common medical misconception (such as “If you touch a toad, you’ll get warts”). Subjects are then presented with a contradictory statement that is assumed to be true. They are then asked to resolve the inconsistency by either retaining the initial rule they were presented with (the general solution), or opposing this belief by choosing a particular which falsifies it (the particular solution). We hypothesize that the stronger the confidence in a medical belief, regardless of validity, the more likely a subject will support the general solution, especially in rending problems. When confidence in the belief is low, subjects will show no preference, or slightly prefer the particular solution for both combining and rending problems. Solution preferences for these problems give us insight into how people reason about medical beliefs and respond to situations and contradict those beliefs.

Return to the CAMP 2009 project list