Education

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

California Alliance for Minority Participation

California Alliance for Minority Participation (CAMP)
Summer 2007 - Student Projects

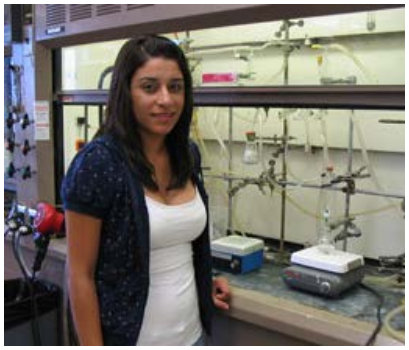
Student Major	Mentor	Faculty Sponsor	Department	Student Project
Sandra Bravo Biology	Abdul Hackim	Daniel Little	Chemistry and Biochemistry	FORMATION OF A-C-GLYCOSIDE
Ernesto Carrillo Electrical Engineering	Xihong Chen	Martin Moskovits	Chemistry and Biochemistry	METAL NANOPARTICLES SEMICONDUCTOR NANOWIRES SYSTEMS$_3$
Victor Crampton Electrical Engineering	Hisashi Masui	Steven Denbaars	Materials	FABRICATION OF WHITE LED LIGHT BULBS
Manuel Galan Chemical Engineering	Robert Farina	Matthew Tirrell	Chemical Engineering	MODELING OF POLYELECTROLYTE BRUSHES IN VARIOUS IONIC ENVIRONMENTS
Aurea Q. Gomez Chemical Engineering	Erin Brocker	Gui Bazan	Chemistry and Biochemistry	SYNTHESIS OF POLY(*PARA*-PHENYLENEVINYLENE) (PPV) OLIGOMERS TO MODEL CHARGE TRANSPORT IN THE POLYMER
Armando Marquez Mechanical Engineering	John Tamelier	Kimberly Turner	Mechanical Engineering	BIOLOGICAL INSPIRED REVERSIBLE ADHESIVE
Christian Michel Ecology and Evolution	Alice Levine	Carla D'Antonio	Ecology, Evolutionary and Marine Biology	PRESCRIBED FIRE EFFECTS ON NATIVE AND INVASIVE PLANT GERMINATION
Jose Muro Mechanical Engineering	Guarav Soni	Carl Meinhart	Mechanical Engineering	INDUCED-CHARGE ELECTRO-OSMOSIS
Manuel Olmedo Physics	Michael Callahan	Mattanjah de Vries	Chemistry and Biochemistry	SYNTHESIS AND R2PI OF PYRIMIDINE DERIVATIVES

Sal Ponce Physics	Ishai Rubin	Phillip Lubin	Astrophysics	CREATING CORRUGATED HORNS TO MAP THE EARLY UNIVERSE
Jesús Torres Mechanical Engineering	Ketan Savla	Francesco Bullo	Mechanical Engineering	MOTION COORDINATION AND LOCALIZATION
Elisa Vega Biochemistry	Erin Mulholland	William C. Smith	Molecular, Cellular, and Developmental Biology	SCREENING FOR MUTATIONS IN THE WILD POPULATION OF *CIONA INTESTINALIS*: A FURTHER APPROACH TO ELUCIDATING DEVELOPMENTAL PATHWAYS.
Natalie Wilson Biological Sciences	Aubrey Cano	Craig Carlson	Ecology, Evolution, and Marine Biology	BACTERIAL ABUNDANCE IN THE SOUTH PACIFIC

Return to the RISE homepage

Site Map // Webmail // Site Privacy Notification Guidelines // National Science Foundation // UCSB

Sandra's Project Page - CAMP Summer 2007



Intern: Sandra Bravo, Biology
Mentor: Abdul Hackim
Faculty Supervisor: Daniel Little
Department: Chemistry and Biochemistry

FORMATION OF A-C-GLYCOSIDE

Glycoside linkages are significant elements of numerous bioactive natural products. Numerous antibiotics and anticancer agents contain a sugar group attached to an aglycone through a standard O-linked glycoside bond. Although there are various cases of C-linked glycosides, they are less well-known. The C-glycoside is more stable compared to the O-glycoside linkages which are susceptible to chemical or enzymatic cleavage. This raises the idea of possibly replacing relatively unstable O-glycosidic linkages of natural products with more stable C-glycosidic linkages. However, the bioactivity of such molecules may be affected, due to the different geometries resulting from a carbon linked glycoside versus an oxygen linked glycoside. To be able to understand the effect of replacing the O-glycoside bond, the focus of this research is to investigate the creation of a C-glycoside. The following is one of several existing methods for the formation of an ?-C-glycoside which is used for this research. The first step is creating an epoxide which is then opened with the addition of titanocene dichloride. The resulting radical is trapped by a stabilizing group which in this case is phenyl vinyl sulfone. The resulting molecule can then undergo a Julia olefination reaction allows broadening the utility of the C-glycoside. The expected result is to accomplish the reactions and expect the replacement of an O-glycosidic bond with a C-glycosidic bond to increase stability and decrease enzyme/chemical cleavages.

Return to the CAMP 2007 project list

Ernesto's Project Page - CAMP Summer 2007

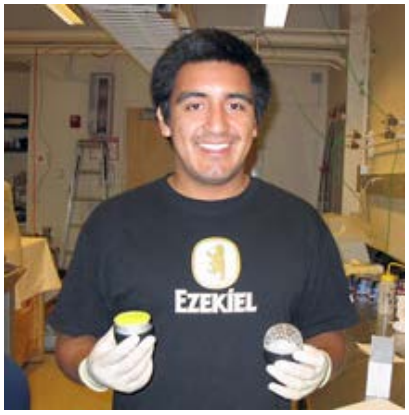
Intern: Ernesto Carrillo, Electrical Engineering
Mentor: Xihong Chen
Faculty Supervisor: Martin Moskovitz
Department: Chemistry and Biochemistry

METAL NANOPARTICLES SEMICONDUCTOR NANOWIRES SYSTEMS

Metal-oxides were traditionally used as gas sensors. This principle is based on the fact that the surface states which affect the electric properties of material change under different target gases. In 1-D systems, like nanowires, the high surface-to-volume ratio makes them natural contenders for sensors. Tin oxide nanowires were synthesized using chemical vapor deposition (CVD) and then transferred to a SiO_2/Siwafer. Micropads of Titanium/Aluminum/Nickel/Gold were vapor deposited which served as the source and the drain electrodes. The electric properties of a single tin oxide nanowire device configured as a field effect transistor were measured. It was found that oxygen decreases the conductivity of nanowires while hydrogen does the opposite. This phenomenon can be explained by the change of the carrier charge density in nanowires caused by annihilation or creation of oxygen vacancies on the surface of nanowires. Decorating the nonawires with transistor metal nanoparticles (like Pd) is proven to enhance the sensibility of the SnO_2 nanowires. Also, supported metal particles form a Schottky junction with the semiconductor nanowire. If the particle is small enough, catalytic processes on the surface of the nanoparticle modulate the charge depletion region thereby modifying the current through the nanowire. Reciprocally, the application of a gate potential can in principle alter the surface chemistry taking place on the metal nanoparticle. This points the way to the study of propertied (catalysis) on single particles through the intermediacy of the charge transfer processes involved in the reaction.

Return to the CAMP 2007 project list

Victor's Project Page - CAMP Summer 2007



Intern: Victor Crampton, Electrical Engineering
Mentor: Hisashi Masui
Faculty Supervisor: Steven Denbaars
Department: Electrical Engineering

FABRICATION OF WHITE LED LIGHT BULBS

Energy saving appliances provides one avenue for more sustainable resource use. Light Emitting Diodes (LEDs) are perfect for energy saving devices because they produce more light per unit power (watt) than incandescent bulbs. The Solid State Lighting Display Center (SSLDC) at UCSB has been working with single LEDs in conjunction with phosphorous layers in the creation of white light. This summer, SSLDC has had an interest in creating test systems for phosphorus layers on arrays of LEDs. These test systems will be use for light bulb fixtures and will have blue LEDs built into them. Layers of silicone and a phosphor mixture of cerenium doped yittium aluminum garnet (YAG) will be placed on top of the blue LEDs to emit white light. The goal of the test system is to focus on the optimal of phosphor concentration to maximize luminous flux. From measurements and calculations it is estimated that the maximum theoretical luminous flux that our blue LED bulb could have is 48lm. This will be at .3 in the x-coordinate of the chromatic chart. A 1.75mm layer of silicone and phosphor was fabricated with a 4% phosphor concentration. The light emitted measured to have an x-coordinate of .302 in the chromatic chart, and had a total luminous flux of 27lm, resulting in 44% loss in luminous flux. Further research is being done, in order to understand what the major factors that are causing the 21lm loss in the phosphor test system.

Return to the CAMP 2007 project list

Manny's Project Page - CAMP Summer 2007

Intern: Manuel Galan, Chemical Engineering
Mentor: Robert Farina
Faculty Supervisor: Matthew Tirrell
Department: Chemical Engineering

MODELING OF POLYELECTROLYTE BRUSHES IN VARIOUS IONIC ENVIRONMENTS

Polyelectrolytes are polymers with repeating charged monomer segments. Polyelectrolytes are used in biological applications such as in coating the surfaces of artificial joints and also in commercial applications which include shampoo and skin care products. Understanding polyelectrolyte behavior is essential to the improvement of these applications. The polyelectrolytes we study are composed of a hydrophobic neutral block and a hydrophilic polyelectrolyte block which contains negatively charged segments. In an aqueous solution with a hydrophobic surface present, polyelectrolytes tether to the surface by anchoring themselves with the hydrophobic block. The hydrophilic tails extend into the solution forming what are called “polyelectrolyte brushes”. Depending on the salt concentration in the solution surrounding the polyelectrolyte brush, we determine the brush to be functioning in either an osmotic or a salted brush regime. An osmotic brush regime occurs when there are a greater number of counterions inside the brush than the concentration of salt in the solution. The salted brush regime has a greater external salt concentration than the concentration of counterions inside the brush. The purpose of this work is to model these brushes according to force balance and thermodynamic equations. With these equations, the forces of interaction between polyelectrolytes in different salt concentrations will be calculated. These models will be compared to future experimental results using a Surface Forces Apparatus (SFA). Gaining a greater understanding of these brushes can lead to new ideas and breakthroughs both commercially and biologically.

Return to the CAMP 2007 project list

Aurea's Project Page - CAMP Summer 2007

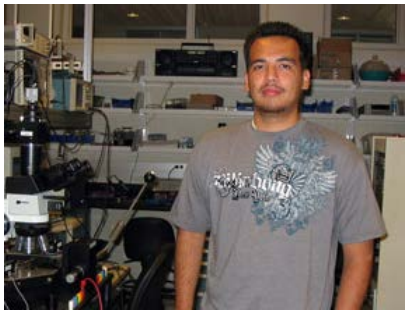
Intern: Aurea Q. Gomez, Chemical Engineering
Mentor: Erin Brocker
Faculty Supervisor: Gui Bazan
Department: Chemistry and Biochemistry

SYNTHESIS OF POLY(*PARA*-PHENYLENEVINYLENE) (PPV) OLIGOMERS TO MODEL CHARGE TRANSPORT IN THE POLYMER

Abstract pending faculty approval

Return to the CAMP 2007 project list

Armando's Project Page - CAMP Summer 2007



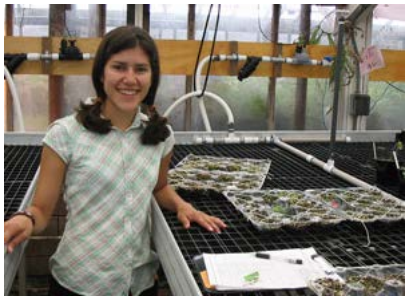
Intern: Armando Marquez, Mechanical Engineering
Mentor: John Tamelier
Faculty Supervisor: Kimberly Turner
Department: Mechanical Engineering

BIOLOGICAL INSPIRED REVERSIBLE ADHESIVE

The Tokay Gecko is the heaviest animal that uses an adhesion mechanism to stick to surfaces. The gecko is able to adhere to most surfaces using induced-dipole van der Waals forces. The gecko's "setae", a section of flesh that connects the toe to the nano-size "spatula" shaped tips, help facilitate the van der Waals forces. The current designs mimicking the gecko's setae are micron size cantilevers that are created through microfabrication techniques. The cantilever arms are bent upward, due to residual stress from the microfabrication process, thereby increasing contact area with an incoming object. Once an object comes into contact with the cantilever, the cantilever adheres and is able to conform to the shape of the object. Tests prove that adhesion does occur; but releasing the object from the cantilever has yet to work successfully. The current method being tested is using thermal actuation as a means to release the object from the cantilever. By applying a voltage to the devices, the cantilever will begin to bend away and release itself from the object. Using a Doppler-shift laser vibrometer to measure out-of-plane velocity, the displacement is derived from this measurement. The results showed large displacements occurred at low frequencies and high voltages. Future research will to continue the development of the cantilever design to better imitate the gecko's releasing mechanism.

Return to the CAMP 2007 project list

Christian's Project Page - CAMP Summer 2007



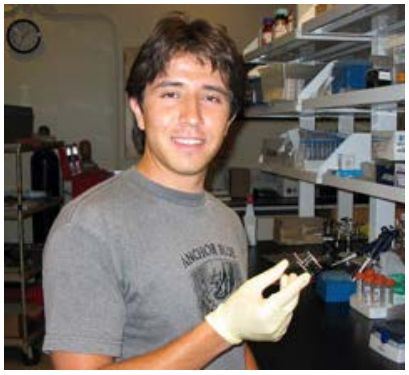
Intern: Christian Michel, Ecology and Evolution
Mentor: Alice Levine
Faculty Supervisor: Carla D'Antonio
Department: Ecology, Evolution, and Marine Biology

PRESCRIBED FIRE EFFECTS ON NATIVE AND INVASIVE PLANT GERMINATION

Abstract pending faculty approval

Return to the CAMP 2007 project list

Jose's Project Page - CAMP Summer 2007



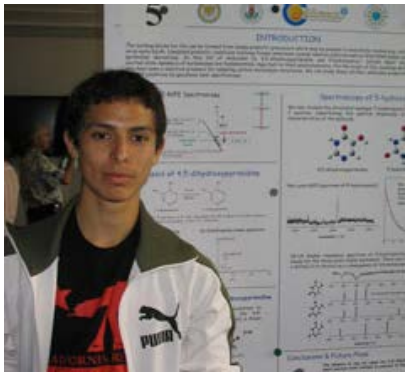
Intern: Jose Muro, Mechanical Engineering
Mentor: Guarav Soni
Faculty Supervisor: Carl Meinhart
Department: Mechanical Engineering

INDUCED-CHARGE ELECTRO-OSMOSIS

Development of microscale devices for pumping fluid without moving parts has been an important area of research. The ability to move very small volumes of fluid has many important applications such as, dispensing therapeutic agents into the body, cooling of microelectronic devices and chemical/biological analysis. Transporting fluids at small length scales (10^{-6}m and 10^{-9}m) allows for certain scaling laws to be used. An example includes, electric fields that can be used to attract charged ions in a fluid, causing an overall flow. Induce-charge Electro-osmosis (ICEO) has recently been shown to create fluid flow at the microscale. Polarizing conductors in electrolyte solutions by means of an electric field causes ICEO. This project deals with the numerical and experimental investigation of ICEO flow around a metal cylinder. A device for studying ICEO experimentally was created. Micro Particle Image Velocimetry (?-PIV) was used to calculate the velocity of the fluid around the cylinder. Flow was also simulated using a commercial finite element program. Symmetrical flow around a metal cylinder was achieved experimentally. The experiments showed velocities up to 50?m/s for an electric field of 1666V/m. The experimental velocity was one order of magnitude lower than simulations. The direction of flow far from the cylinder surface was not congruent with that of the simulation. Closer to the surface of the cylinder the direction of the flow matched the simulation. Further studies need to be carried out to understand the unique flow patterns that occur far and close to the cylinder surface.

Return to the CAMP 2007 project list

Manuel's Project Page - CAMP Summer 2007



Intern: Manuel Olmedo, Physics
Mentor: Michael Callahan
Faculty Supervisor: Mattanjah de Vries
Department: Chemistry and Biochemistry

SYNTHESIS AND R2PI OF PYRIMIDINE DERIVATIVES

Abstract pending faculty approval

Return to the CAMP 2007 project list

Sal's Project Page - CAMP Summer 2007

Intern: Gilberto Ponce, Physics
Mentor: Ishai Rubin
Faculty Supervisor: Phillip Lubin
Department: Astrophysics

CREATING CORRUGATED HORNS TO MAP THE EARLY UNIVERSE

A highly spectacular scientific breakthrough in the past century was the discovery of the Cosmic Microwave Background Radiation (CMB), and the accurate measuring of its fluctuations. Methods for mapping this microwave radiation include ground based, balloon borne, or space flights projects. Our project is called the Cosmic Foreground Explorer (CoFE) It is a balloon borne telescope that uses mirrors to focus microwaves into receiving centimeter wavelength corrugated horns (antennas), which then send the signal to amplifiers, detectors and a computer that converts it to a digital signal. The purpose of the corrugated horns is to prevent the microwave radiation from coupling to the inside walls of the horns, thus minimizing loss of signal. A 10 GHZ microwave has a wavelength of 3 cm, thus in order to prevent coupling to the walls, the walls are corrugated with groove depths of about 0.75 cm. The method being used to machine these horns is an experimental method, using a CNC to machine aluminum stock into a series of rings that can be assembled in order to make a whole horn. This will reduce our weight significantly, and will allow for simpler more efficient manufacturing. By mapping the CMB we can have a better understanding of the early universe and test theories of the beginnings of our universe.

Return to the CAMP 2007 project list

Jesse's Project Page - CAMP Summer 2007

Intern: Jesús Torres Jr, Mechanical Engineering
Mentor: Ketan Savla
Faculty Supervisor: Francesco Bullo
Department: Mechanical Engineering

MOTION COORDINATION AND LOCALIZATION

Abstract pending faculty approval

Return to the CAMP 2007 project list

Elisa's Project Page - CAMP Summer 2007

Intern: Elisa Vega, Biochemistry-Molecular Biology
Mentor: Erin Mulholland
Faculty Supervisor: William C. Smith
Department: Molecular, Cellular and Developmental Biology

SCREENING FOR MUTATIONS IN THE WILD POPULATION OF *CIONA INTESTINALIS*: A FURTHER APPROACH TO ELUCIDATING DEVELOPMENTAL PATHWAYS

Ciona intestinalis is a solitary sea squirt that has a motile larvae stage and a sessile-filter feeder adult stage. The most important feature of these ascidia is their close relation to vertebrate morphogenesis. Wild *Ciona intestinalis* were collected and allowed to self- fertilize in order to identify any mutations that cause an abnormal phenotype in the larvae-stage sea squirts. The current goal is to identify the location of a mutation observed in one of the screened *Ciona intestinalis*. The phenotype (short tail) of the identified mutant has a very close similarity to that of a mutant called aimless observed in a different species called *Ciona savignyi*. The mutation in *Ciona savignyi* is linked to the prickle gene, which is involved in notochord morphogenesis. Sequencing was carried out on the *Ciona intestinalis* mutant DNA to determine if this mutation shows linkage to the prickle gene of the aimless mutation. Since it has already been determined, via sequence analysis, that the mutation is not linked to the prickle gene, the next approach is to test a panel that will cover of all the chromosomes and the region within each chromosome that the mutation might be located in. This is carried out to determine which chromosome arm shows linkage. Until this panel is tested and sequencing is carried out, the location of the identified mutation remains unknown along with its specific genetic effects on morphogenesis.

Return to the CAMP 2007 project list

Natalie's Project Page - CAMP Summer 2007

Intern: Natalie Wilson, Biological Sciences
Mentor: Aubrey Cano
Faculty Supervisor: Craig Carlson
Department: Ecology, Evolution, and Marine Biology

BACTERIAL ABUNDANCE IN THE SOUTH PACIFIC: A FURTHER APPROACH TO ELUCIDATING DEVELOPMENTAL PATHWAYS

Bacteria play an important role in the microbial food web. They take up dissolved organic carbon (DOC), which can be passed to higher trophic levels of the microbial food web or respired to CO_2. Bacterial abundance is extensively studied in estuaries and oceanic coastlines, but little is known about overall distributions of bacteria in open oceans. This project sought to find how bacterial abundances change in the open South Pacific. Samples of seawater were taken from up to 500 meters along the P16South (150°W longitude) line, starting at the equator and ending near Antarctica. Bacteria were collected onto a filter and stained with a DAPI nucleotide fluorescent stain, which enabled us to count them under epi-flourescent microscopy. Abundance data was analyzed to examine if relationships existed with changes in latitude, depth, temperature, chlorophyll a, and DOC. There was no large change in abundance with latitude, which suggests that bacteria may have become well adapted to a wide range of temperatures and environments. Abundance was always higher at the surface (0-150m) than lower depths (150-500m). Surface waters at different latitudes can have a wide range of bacterial abundances, which may be a function of water stratification due to temperature (near the equator) or salinity (near Antarctica). Chlorophyll a and DOC show weak positive relationships with abundance in the South Pacific. Although chlorophyll a and DOC are required for bacteria to grow and divide, variability in bacterial abundance seems to be more closely related to water stratification due to temperature or salinity.

Return to the CAMP 2007 project list