Committee On Research Special Research Grants 2004 - 2005

Margarita Azmitia
Psychology Department

A Longitudinal Study of the Resources and Challenges in Underrepresented Students' College Pathways

This longitudinal project examines the resources and challenges that students from groups that are underrepresented at UC encounter as they move through UCSC, in particular, ethnic minorities and low-income students who do not have a history of going to college. We investigate the role of participants' family, friends, and the institution in their academic self-efficacy, academic performance, and mental health. We also examine whether and how going to college provides young adults with opportunities to negotiate their educational, career, gender, ethnic, and social class identities. The participants were recruited during their frosh year at UCSC. They completed 2-3 hour survey and interview sessions during their frosh and sophomore years. This SRG will fund the senior year survey and interview sessions.

Murray Baumgarten
Literature Department

Peter Kenez
History Department

The History and Literature of the Holocaust in Dialogue

We (Murray Baumgarten and Peter Kenez) are planning a collaborative research project in integrating the study of history and literature concerning the Holocaust. The idea grew out of a course that we have been regularly teaching in the course of the last two decades. We have established contact with Cambridge University Press, which had expressed interest in publishing our work. We will examine how a complex topic can be best understood by bringing together several disciplinary approaches (history, film and literature). The first part of our study will be devoted to a description and illustration of European Jewish life in the decades before the Holocaust. This part of the study will be based on secondary sources on social history and analysis of literary texts. This section will be followed by the description of the sources of anti-Semitism, fascism and Nazism and the development of Nazi policies toward the Jews. Autobiographies and literary texts will illustrate. The third and most important part of the study will be devoted to the process of extermination. We plan to use the rich archival collection at the Holocaust Museum in Washington and visit the sites of concentration and extermination camps. It is for this purpose that we need material support.

Dr. Giacomo Bernardi
Ecology and Evolutionary Biology Department

Darwin's Fishes: A Study of the Origin of Galapagos Fish Species

The Galapagos Islands are a spectacular natural laboratory to study evolutionary

processes. There, finches, mockingbirds, tortoises, and iguanas have inspired generations of biologists, starting with Charles Darwin, who highlighted the processes by which species originate. Surprisingly, little is known about the evolutionary characteristics of the underwater Galapagos. This project aims at estimating the genetic differences between island populations of marine fish species. Using state-of-the-art molecular techniques, we will determine the levels of genetic isolation between island populations and possibly uncover elusive speciating mechanisms in marine systems.

Catherine Byrne
Psychology Department

Narratives of Suffering and Resilience from Survivors of Human Rights Violations: A Comparative Study

Psychological research will be conducted on the experiences reported by victims of gross human rights violations with transitional justice mechanisms. This comparative study will include an international approach with a focus on participation by victims in: the South African Truth and Reconciliation Commission; the United Nations International Criminal Tribunal for the Former Yugoslavia; the Guatamalan Historical Clarification Commission and Rwandan Gacaca community processes. Through the use of in-depth interviews, victims' narratives of participation as well as past suffering and current resilience will be studied. Qualitative data coding techniques will be used to explore the richness of this meaningful and important material.

Brian A. Catlos
History Department

Conflicts of Interest: Minority Administrative Elites in 14th Century Aragon

Contrary to the views of traditional historiography, the autonomous Muslin and Jewish communities of the medieval Crown of Aragon were governed by a class of administrators who straddled the ethno-religious divide, comprising a "hinge" group between their own communities and the larger society of the Christian-ruled Crown. This project, based on an exhaustive survey of published documentation and original archival research, investigates informal networks of patronage and influence which bound lower-level Muslim, Jewish and Christian officials as an oligarchical clique whose individual interests often ran contrary to those of their own communities. The study will consist of two main sections. The first will be substantial overview of minority administrative structures in the Crown and the fundamentals of Christian-Muslim-Jewish interaction at the local level. The second will consist of narrative "case studies" examining a series of local administrative "dynasties" and scenarios which explore the principles elaborated in the first part. The study will help to illuminate the nature of ethno-religious relations in a colonial context not only in Medieval Spain and the Mediterranean, but – thanks to its theoretical component – analogous situations in the Early Modern and Modern eras.

Shaowei Chen
Chemistry Department

Photo-Gated Electron Transfer of Quantum Dot Organized Assemblies

The central goal of this research project is to investigate the solid-state electron transfer properties of semiconductor quantum dots (QDs) within the context of photochemical and photophysical manipulation. Specifically, organically capped QDs will be assembled at the air|water interface where the interparticle separation can be controlled readily by the Langmuir technique. The corresponding electronic conductivity will then be probed with a vertically aligned interdigitated arrays (IDAs) electrode, and effects of photoexcitation on the voltammetric responses will be carefully and systematically examined. This unique in situation approach allows one to establish a direct correlation between the nanoensemble structures and electronic properties which is anticipated to provide unambiguous insights into the molecular regulations of electron transfers at nanoscale interfaces. For comparison, dropcast thick films of the QDs will also be used to investigate the effect of ambient oxygen on the chemical stability of the QD ensembles and the reversibility of the electronic conductivity properties. Fundamentally, this will provide a rare glimpse of the molecular basis on which the electron transfer between nanoparticle molecules is regulated. Technologically, the success of this research project will have broad impacts on molecular engineering of nanoscale structures, where an understanding of the electron-transfer mechanism is a key to the development of novel opto-electronic nanodevices, electrical nanocircuits, etc.

E.G. Crichton
Art Department

Matter Out of Place

Matter Out of Place is an exploration based on experiments with unlikely materials and processes masquerading a other forms of representation. Digital images that take on the appearance of microscopic, cosmic, and aerial mapping originate as chemical reactions between ordinary household products. A video component involves analogous processes that when shot at close range resemble weather patterns or primordial soup.

The term *Matter Out of Place* is a definition of dirt crated by anthropologist Mary Douglas. This work grows out of my interest in cultural notions of purity, cleanliness, and civilization. The abstract patterns create tension between an extravagant beauty and the revelation of its artifice, the ordinariness of its representational ingredients. Through the visual seduction of pseudo-scientific representation, I look for larger metaphors of disturbance and displacement.

Carlos Dobkin
Economics Department

Ricard Gil
Economics Department

The Impact of Local Prohibition of Alcohol Sales

The goal of this project is to examine the impact of local prohibition of alcohol sales. The US has a long history of attempting to reduce alcohol consumption by restricting its sale, the most notable example being the national experiment with prohibition in the 1920's and early 1930's. The potential benefits of prohibition are a reduction in alcohol related health problems

and crime. Some problems with prohibition is that individual's attempts to circumvent the law may result in outcomes worse than those that would have occurred in the absence of prohibition, as well as a reduction in tax revenue. We will pursue this analysis using Texas administrative and survey data on car accidents, hospital admissions, alcohol consumption and county economic data and crime data. Texas counties vary significantly in how stringently they regulate alcohol, ranging from counties that completely forbid alcohol sales to those that have no restrictions at all. We will examine how alcohol consumption, alcohol related hospital admissions, car accidents, crime, and tax revenues vary across counties with different laws regarding alcohol. We also leverage recent changes in the laws in some Texas counties to estimate the short term causal impact of alcohol legalization of these outcomes.

Barbara Epstein
History of Consciousness Department

Weak Anti-Semitism: 1930's Soviet Minsk (and Post War Minsk, for comparison)

This is a study of the weakness of anti-Semitism in 1930's Minsk, Belorussia. During the 1930's anti-Semitism was strong in neighboring Poland and Lithuania. In Soviet Ukraine (as in Soviet Belorussia) expressions of anti-Semitism were illegal, but during the German occupation, the resurgence of anti-Semitism in Ukraine showed that suck sentiments survived legal repression. According to preliminary interviews with Jews who were young in 1930's Minsk, relations between Jews and Belorussians were good. I will interview Jews and non-Jews now in their 80s and 90s on this topic, and try to understand the character of these relations and the reasons why they might have been better than elsewhere in the region. Anti-Semitism, in Eastern Europe, was based on traditional Christian stereotypes, and also on modern views of Jews as obstacles to nationalist aspirations, and promoters of Communism. My hypothesis is that anti-Semitism was weak in 1930's Belorussia, due to the historical weakness of nationalism, and the absence of any organized anti-Communist movement. This was no doubt especially true in Minsk, where Communist culture was strong. Anti-Semitism and other forms of racism have been extensively studied. This is a study of a case of surprisingly weak anti-Semitism.

Wendy Hibbert-Jones
Art Department

Descriptive Title of Project: PP Valise

PP VALISE is a sculpture, performance, web site and public artwork that investigates pharmaceutical advertising and the commodification of health. The "PP Valise" exhibition and demonstration will take place in public spaces, and non-profit art spaces in Western Europe and Israel beginning in the summer of 2005. PP VALISE is a series of highly designed, collapsible sculptural objects, housed in suitcases, promising to soothe mood and anxiety disorders. The Panic Attack Headset, for example, is a portable monitor and sound unit, worn behind the ear, to soothe Panic Attacks. Each of the PP products is designed in consultation with mental health experts. The performances/"sales pitch" presentation, includes a PP website, an infomercial and demonstrated use of each product. Through a pseudo-scientific product line and the language of advertising, the project seeks to explore issues of art as commodity, art as a tool to heal and art as social dialogue. The project intends to open up discussion, raising questions of vogue in mental

health, exploring big industry's role in mental health condition, opening up debate of these issues.

Junko Ito
Linguistics Department

Armin Mester
Linguistics Department

Jaye Padgett
Linguistics Department

Systemic Constraints in Phonology

Recent work in theoretical phonology appeals to functional notions like *neutralization avoidance* and *perceptual distinctiveness*: sounds in languages sometimes avoid becoming identical to contrasting sounds, or they become perceptually more distinct from them. Our recent work has uncovered evidence of such tendencies in Japanese (Ito and Mester) and in Polish and Russian (Padgett). Adequately formalized, these notions have the potential to explain a surprising array of phonological patterns. This is a relatively novel approach to phonological problems, bridging a historical divide between theoretical linguistics and experimental phonetics. In order to better develop the phonetic side of this work, we request funding to set up a low-cost phonetic lab. Funding is requested for one portable sound-proof booth, two computers, and a GSR to help set up the lab.

Joel Kubby
Electrical Engineering Department

Three-Dimensional MEMS for Adaptive Optics

This research proposal is to investigate the use of a 3-dimensional Micro-Electro-Mechanics Systems (MEMS) process to prototype deformable mirrors for use in the adaptive optics system in the California Extremely Large Telescope (CELT), a $500M project led by University of California at Santa Cruz and the California Institute of Technology that is now in the early planning stages. Adaptive optics technology is key to the success of this project that is expected to have an important impact on the field of astronomy. It would enable astronomers to observe nearby star-forming regions to study the births of stars and to look for planets around nearby stars. Astronomers could also use CELT to study distant galaxies to understand how galaxies and stars formed early in the history of the universe. A critical component of CELT will be the adaptive optics system to correct for the blurring effects of the atmosphere which is seen by the chief scientist, Prof. Jerry Nelson (UCSC Center for Adaptive Optics), as the hardest part of the project. This research project will be aimed at solving this problem using an existing 3-dimensional MEMS fabrication process. If successful, the results of the SRG funding will be used to leverage significant levels of external funding ($500M) planned for the design and construction of the California Extremely Large Telescope.

Paul Lubeck

Sociology Department

Alan Richards
Environmental Studies Department

Petro-Politics and Strategic Conflict in Two Gulfs: Comparing the Persian Gulf and the Gulf of Guinea in American Energy Security Planning for the 21st Century

Not long after President George W. Bush began his first term in office, the National Energy Policy Development Group, headed by Vice President Cheney, made clear that the United States should diversify its sources of petroleum and look to Africa's "Oil Triangle" in the Gulf of Guinea as a future source of American supply. A key number of petro-states are weak (e.g., Iraq), failing (Saudi Arabia) or hostile (Iran) to U.S. designs. Combined with growing concerns about the reliability and stability of Persian Gulf regimes, the U.S. military has begun to increase its military presence and influence in several western Africa states. These developments are reflective of a fundamental contradiction in what Michael Klare (2004) calls the "economization of security," namely, that an important strand of U.S. foreign policy since the 1930s has been focused on global oil acquisition policy, yet, this policy is currently in a shambles. The consequence is that the secure supply of oil for the United States, in a tight global market, is increasingly in question. This project will research the national, regional and strategic implications and effects of this oil policy in two of the world's oil provinces, the Persian Gulf and the African Oil Triangle in the Gulf of Guinea. With funding from other sources, we will also conduct a workshop in Washington, DC during Winter Quarter 2006 on the security implications of this issue and future funding of the project.

Roberto Manduchi
Computer Engineering Department

A Tactile Mapquest for the Blind

There are an estimated 200,000 totally blind individuals in the US. Approximately six times this number are legally blind, but they still have some usable vision left which is not correctable by standard eyeglasses. They experience difficulty performing visual tasks, because of reduced acuity or field of view. We are proposing a new concept, aimed at providing a way for a blind individual to explore a map using a force–feedback mouse. Currently, map education and navigation for the blind is limited to tools such as printed Braille maps and audio guides. Tactile and haptic products such as touch pads and force feedback mice or joysticks provide an interactive environment where the user can "feel" their way through the map. It would then be possible to use such interface mechanisms to download maps from the Web and "explore" them, much the same way a seeing person uses products such as Mapquest.

Matthew McCarthy
Ocean Sciences Department

Sampling Deep Ocean Particles for Evidence of a New Source in the Oceanic Carbon Cycle: Archeabacterial Chemosynthesis in Mesopelagic

Particulate and dissolved organic matters (POM & DOM) represent the major carbon storage reservoirs and transport pathways in the oceanic carbon cycle. However, the sources and chemical forms of most of these materials in the deep sea are not well understood. Recent natural abundance 14 C data is dramatically reshaping our views of their sources, composition, and cycling rates. Accumulating evidence suggests there may be unknown sources of "old" (14 C-depleted) carbon to both POM and DOM in the lightless mid-ocean depths, which are difficult to reconcile with current understanding or organic carbon cycling. One of the most intriguing hypotheses to explain some of these observations is a novel mid-winter (mesopelagic) fixed carbon source: chemosynthetic archaea, a class of microorganisms recently discovered to be highly abundant in the deep sea. We propose here a novel project test this hypothesis. We will fabricate an ultra-large volume nano-filtration apparatus, and take advantage of a unique deep-pipeline installation to collect large deep Pacific POM samples. This novel sample set will allow coupled 14 C and organic chemical analyses needed to directly probe an "old" chemosynthetic source, while simultaneously allowing a more detailed understanding of deep ocean suspended POM cycling than has previously been possible.

Ravi Narasimhan
Electrical Engineering Department

Fundamental Tradeoffs in Realistic Multiple-Antenna Wireless Channels

The proposed research consists of the investigation of *fundamental performance limits* in multiple-antenna wireless systems for *non-asymptotic* and *realistic* operating conditions. Specifically, a novel framework for the tradeoff of spatial diversity and spatial multiplexing at finite signal-to-noise rations (SNRs) in multiple-input multiple-output (MIMO) systems will be investigated. The new framework is based on the MIMO outage probability as a function of SNR. The tradeoff will be computed for systems with and without channel knowledge at the transmitter for a various realistic channel conditions, such as spatial correlation and line-of-sight propagation of signals. The new multiplexing and diversity measures introduced from this research will provide significant insight into space-time coding schemes with increased diversity at given spatial multiplexing rates, operational SNRs and realistic channels. These new coding techniques will offer the enhanced performance required for future mobile broadband multimedia services.

Manuel Pastor
Latin American and Latino Studies Department

California's Latino Working Poor: Analysis and Policy

With analysts and policy makers increasingly concerned about working poverty, a series of studies by both academics and advocacy groups have attempted to document the size and nature of the problem. Despite disagreements about methods, particularly definitions of both work and poverty, virtually all studies concur that California has become a key node of such poverty and that Latinos are disproportionately represented in the ranks of the working poor. Yet the specific nature and causes of Latino working poverty have often gone unexplored, partly due to the reliance of relatively small sample surveys that rendered detailed breakdowns statistically unreliable. This research will make use of 2000 Public Use Microdata Sample (PUMS), a

sample that includes five percent of the state's population, to offer an unusually detailed portrait of the Latino working poor in California, including breakdowns by nativity, recency of immigration, and geographic location. We will combine the 2000 data with PUMS data from pervious years to examine shifts in the nature of Latino working poverty over time, and will conduct regression analysis to isolate the factors that contribute to such poverty. The project will result in several academic publications and a popular document highlighting the implications for policy.

Chad Saltikov
Environmental Toxicology Department

Todd Lowe
Computer Engineering Department

Identification of the Arsenate Respiratory Reductase in Hyperthermophilic Archaea

Hyperthermophilic archaea within the genus *Pyrobaculum* are widespread and are one of the most abundant organisms in numerous geothermal environments. Waters originating from these environments are often a source of arsenic, a human carcinogen, to surface water. Hyperthermophilic archaea such as *Pyrobaculum* are highly adapted to like in environments of extreme temperature (greater than 80°C). Moreover, the genus *Pyrobaculum* represents a unique clade among the Archaea because its cultured members respire toxic metals such as arsenic and other inorganic substrates. The molecular basis for this metabolism appears to be different in mesophilic bacteria. The goal of this project is to identify the molecular biological basis for arsenic respiration in *Pyrobaculum aerophilum*, a model Creanarchaeal microbe. We will use a whole-genome microarray for *P. aerophilum* to identify genes and regulatory circuits induced or repressed when *P. aerophilum* is respiring toxic compounds such as arsenic. We hypothesize that the whole genome transcription profile of arsenate grown *P. aerophilum* will allow us to identify the genetic basis for arsenic respiration. These results could reveal "novel" modes of arsenic metabolism compared to mesophilic microbes or fundamentally unique enzymes that are adapted to catalyzing arsenic redox chemistry at high temperatures.

Gustavo Vazquez
Film and Digital Media Department

En Esta Esquina (On This Corner) Video Documentary

EN ESTA ESQUINA is a one hour documentary which features a look at the sport of Lucha Libre or Mexican wrestling, specifically the wrestling culture in Tijuana. We will explore how individuals are drawn to this grueling sport as either the wrestler or a devoted fan, many of whom come from the poor working class neighborhoods of Tijuana. There are many layers of complexity to be explored: Universal themes of good vs. evil, the underdog beating the bully, the noble hero outwitting the corrupt nemesis – all these themes played out over and over to generations of fans who never cease to be entertained. The wrestler devote themselves to fabricating unique characters that their fans embrace or spew insults at after a long day at the local factory…the wrestlers relish their roles as hero and therapist. Wrestlers assume the personalities of corrupt politicians and cops, crime fighting heroes, mythological figures and

villains. Familiar traces of comic book heroes like Superman, Spiderman, action fighting icons like Bruce Lee or a modern day Robin Hood combine to form one of Mexico's favorite spectator sports. EN ESTA ESQUINA will also provide a brief history of Mexican wrestling, however, the main focus of this project is the contemporary role this ultimate spectator sport plays in society and the outlet it provides for the participant and observer.

Lewis Watts
Art Department

Karlton Hester
Music Department

Fillmore Preservation: Arts and Culture

We propose a collaboration to expand the research that we have been doing separately on the cultural history of the Fillmore District of San Francisco. Prof. Karlton Hester of the Music Department leads the Fillmore Jazz Preservation Big Band that has been working to revitalize the district using music and dance as a catalyst. Prof. Lewis Watts of the Art Department is working on a book of images he has been collecting from the jazz era 1940-60's entitled *"Harlem of the West, The Fillmore Jazz Archives"* to be published in 2006. We are both interested in using multi media and performance to make the public aware of the rich heritage contained within this period coming out of the great migration west during WWII, when large numbers of African Americans settled in the area that had been Japan town, vacated due to internment. The community thrived until the late 1960's when an economic downturn and urban renewal displaced most of the inhabitants and destroyed much of the architecture. The Fillmore Jazz era is only preserved by the music and photographs that have survived.

James Zachos
Earth Sciences Department

Mass Dependent Sr Isotopic Fractionation

Using modern instrumentation many isotope systems have been found to show mass dependence fractionation. Strontium (Sr) isotopes have been used for many years to examine sources of materials, migration of animals and nutrition. These studies have assumed no mass dependence fractionation of Sr. Recent studies on CA, which has a similar chemical behavior to Sr, shows a significant degree of mass dependent fractionation. It can therefore be conjectured that Sr should also show a mass dependent fractionation. This hypothesis will be tested in this study by application to a limited number of different samples where we would expect to detect fractionation.
