MENTAWAI: video images/cultural context for an experimental

MENTAWAI is an experimental multimedia work joining electronic sound collage by composer-ethnomusicologist Linda Burman-Hall using biologist Richard Tenaza’s field recordings of threatened and endangered species with his images of their rain forest habitat, created to increase fine arts audience awareness of environmental conservation as well as to provide a welcome aesthetic dimension for scientists working with regional issues. Featured are the remarkable female duets and other vocalizations of hylobates klossii (the Kloss Gibbon) and other endangered Mentawai primates. Collaborating biologist Richard Tenaza (University of the Pacific), who first documented the duets, writes: ‘The single most fascinating aspect of the Kloss's gibbon singing is the duets produced by neighboring females. The ladies meet at their territorial boundaries and sing in synchrony, performing aerial ‘dances’ together at the height of each song.’ The collaboration of Burman-Hall and Tenaza is structurally that of co-PIs, with shared decision-making. In Fall, 2011, the creative team will complete the 60-70’ piece and develop program notes and talking points for 3 host venues: UC-Santa Cruz, UC-Davis and University of the Pacific. Sponsoring UC departments range from Music/Theatre through Anthropology and Women’s/Gender Studies. I request the SRG to visit to Mentawai Islands to video hylobates klossii and other endangered Mentawai primates as they vocalize; I will also gather information about how the local peoples perceive these primates.
Golden Rule: a new media documentary addressing the 'school-to-
"Golden Rule", a new media documentary, will examine the relation between the impoverishment and militarization of our public education system, racial discrimination in the legal system and the resulting explosive growth of the California state prison system. This online media archive will present personal testimony and statistical evidence of how poor young people of color are fast-tracked: from schools where they are not considered students or productive citizens, but potential criminals; through a legal system burdened with harsh and discriminatory sentencing laws (where “justice” becomes a means of race-based oppression); into juvenile detention and overcrowded adult prisons. Golden Rule will bring the voices of California’s students, educators, parents, police, legislators, lawyers, judges, and prisoners (in both juvenile and adult facilities) together to provide testimony, evidence and analysis addressing what has come to be known as California’s “school-to-prison-pipeline.” The project will comprise an interactive interface to a database of interviews, images and texts designed to serve simultaneously as a work of art, a tool for social activism and a campaign for change in educational and penal policy.
Performance Research: Arizona, Bangalore, Bali

International Performance Research: Bali/Jagriti  I seek travel funding to participate in two international theatre projects: an original mask theatre work in Bali and New York and a dance/theatre performance residency in Arizona and Bangalore India.
World music composition compact disk

My sabbatical project for the 2011-12 academic year is a long-planned series of collaborations in ‘world music composition’ with performers from three different cultures. I will complete three new compositions and do research for a fourth. Three recording sessions are planned: two in Seoul and one in Bratislava. The project will culminate in the publication of the recordings on CD with Centaur Records and the scores with American Composers Editions. In Seoul (August through December 2011) I will complete work on a composition for Daegum (Korean flute) and computer sounds to be performed in concert by the distinguished performer Jeong-Seung Kim and recorded for CD later that fall. While in Seoul I will also collaborate on a new composition for Gayageum (zither) quartet to be recorded for CD in a second studio session. In Israel (January through March 2012) I will work with a Turkish Oud player in preparation for a composition for Oud and ensemble to be completed upon my return. In Slovakia (April through June 2012) I will work with the Bratislava-based ensemble Quasar conducted by Professor Ivan Buffa to complete a new composition for large ensemble and computer sounds. This piece will be performed and recorded for CD during my residency there.
Visual Narrative of the Churning of the Ocean of Milk Story in the Arts

My book project investigates the political role that visual narrative of the Churning of the Ocean of Milk story played in articulating the symbolism of power, ritual, and kingship in Hindu arts and architecture of Ancient Cambodia and Indonesia. I argue that this particular Hindu tale was favor by ancient Cambodian and Indonesian Kings and their artists because these rulers associated themselves with Shiva and Vishnu, the two main Hindu gods featured in the story. Moreover, these Hindu (and Buddhist) Kings were after the nectar of immortality and Lakshmi, the goddess of fortune so to prolong their lives and the prosperity of their kingdoms. In addition, I argue that the motif of the mountain and the ambrosia featured in the story fit into the Javanese and Balinese version of Hinduism which scholars referred to as “Water Religion.” Hindu priests in Bali still evoke the god Shiva who according to the Balinese and Javanese version of the story, has managed to transform the poison emerged from the Churning of the Ocean of Milk into ambrosia. In fact, one finds Balinese Shivaite priests at the temple of Besakhi in Bali, transforming, through the act of ritual, ordinary water into holy water.
The Great Gatsby: Phase II

The purpose of this proposal is to complete Phase 2 of the Gatsby Project through the world premiere performance of its chamber version. By its sheer size (108 musician), the opera was performed only twice. The commissioned new version (Phase 1) and its subsequent premiere will secure this masterwork in the canon of opera. In the past years, my research has focused on orchestral timbral combination through re-orchestration into smaller instrumental forces, as a means to insure the viability of masterworks of contemporary opera. Reducing a score to a smaller ensemble presents the challenge of combining instrumental timbres such that the original intention is preserved; yet the new version can stand on its own as a separately viable work. Since 2009, I have collaborated with composers John Harbison and Jacques Desjardins, to complete the re-orchestration. Preparation for the premiere performance has began and will take place in February 2012 under my direction. This new version of a landmark opera will increase manifold its performance opportunities, and will bring international attention to my study of timbral combination. UCSC and UC will benefit from the increased visibility and will consolidate their role as participants in the preservation of masterworks in performing arts.
The OpenLab Network Project is a new research initiative, which

The OpenLab Network project will pursue the physical development of two new laboratories on campus as spaces to foster interdisciplinary research and establish an on-line social networking system for faculty and student research. Laboratories and studios in both the arts and the sciences will be accessible to users in the OpenLab Network. We will conduct research to acquire skills and knowledge that crosses disciplinary boundaries between science, education, and the arts while sharing expertise in collaborative research methodologies. The physical site and partial expenses for two OpenLab spaces have already been established. One is in the bronze-casting foundry facility located in the art department; the initial renovation costs to date have been supported by the art department. The other OpenLab is located in physical sciences facility (donated by the Dean until a more permanent space can be provided). OpenLab Network Project proposes to explore the following questions: (1) How can we strengthen or create new methodologies that truly engage art and science thinking? (2) Is an interdisciplinary laboratory space for cross-disciplinary and collaborative research more engaging and productive for students and faculty currently lacking these resources?
Carnivore Cam: Practicing Citizen Science with Interactive Online

Online social media provides an underexplored venue for both educating and utilizing the public as citizen scientists. The massive scale of the online community presents a unique resource that can be tapped for data collection purposes, and social media provide fun, intuitive ways to educate these users. Here, we propose a unique collaborative effort between Warren Sack in Digital Arts and Chris Wilmers in Environmental Studies to develop an interactive online game that simultaneously contributes to the data-gathering efforts of Wilmers’ research on mountain lions and educates participants about local biodiversity. By playing the game, participants will tag photos of local species ranging from owls to lions collected from dozens of remotely triggered trail cameras dispersed throughout the Santa Cruz Mountains. Learning behavior of the participants (as measured by their improvement in correctly tagging photos as the game progresses) will be paired with the demographic data of each player (by encouraging them to sign up through their facebook accounts) to test questions about the efficacy of online learning. With the seed money provided by this grant, we will build a prototype of the game, which will place us in a strong position to solicit NSF funding.
Genomics pipeline for natural product discovery and characterization

Microbial natural products remain one of the leading sources of chemical diversity for drug discovery programs. Currently, over half of all FDA approved drugs can trace their origins to natural product scaffolds. However, traditional ‘grind and find’ approaches fail to access much of the biosynthetic capacity of these organisms. We propose to develop a discovery and classification pipeline for efficient exploration of natural product chemistry using a unique ‘genome-first’ approach. The main facets of this project are (1) isolation of marine Streptomyces with the capacity to produce bioactive natural products, (2) culturing and DNA collection of these prokaryotes, (3) DNA sequencing and genome assembly, and (4) genome annotation and analysis. In this proposal, we are requesting funds to generate pilot DNA sequence data for 100 previously identified Streptomyces using the Genome sequencing facilities at UC Santa Cruz. From these data, we will apply a novel assembly and annotation pipeline being developed in our laboratories to identify and exploit the full biosynthetic capacity of these microorganisms.
Genome Exploration at a Critical Branch Point in RNA Evolution

Extremophiles are believed to be some of the most ancient, intriguing life on Earth because of their ability to thrive at boiling temperatures, extreme pH or pressure, and/or extremely high salt concentrations. RNA, on the other hand, is believed by many to be the "original" biological molecule of information and chemical catalysis, the forerunner of DNA and proteins, predating life as we know it. While being supplanted in many of its presumed original roles, RNA genes serve as some of the most informative molecular fossils found every living thing’s genome.

Our group has recently published two exciting results for two of the oldest RNA molecules: discovery of a “minimal” form of catalytic RNase P RNA, and finding that transfer RNA genes are commonly “split” into two pieces in extremophile genomes, possibly as a defense from viral attack. Both of these discoveries were made at one very unique place in the tree of life, the Thermoproteaceae in the domain Archaea. This family of species appears to be at the transition point between “modern”, and ancient forms of these RNA genes. Currently, there are only a few species with genomes decoded at this critical junction, limiting the resolution of our evolutionary understanding. This grant requests funding to sequence the genomes for two critical “missing links” at this very unusual transition point in the history of living things. In previous years, such an effort would have required hundreds of thousands of dollars, but with today’s genome sequencing technology, this has become a key jumping off point for ground-breaking biological and evolutionary research.
The Nagamine Project: A Transnational Collective Research Project

We request funding for work study undergraduate student researchers to establish and plan collaborative research with Japanese colleagues in both online and face-to-face venues. The student researchers will be preparing to conduct research at a variety of archives, institutions and associations in three regions of Japan in the late fall or winter of 2011-2012. The research is on the history of the Japanese empire as it pertains to the specific story of Mr. Akira Nagamine, a former Japanese soldier, now resident in Watsonville, CA. The research will contribute both to a series of publications on Mr. Nagamine's life (a documentary film, a book and a webpage) as well as a study by the co-P.I.s on conducting transnational, multilingual historical research.
Analysis of allele-specific expression defects in mutant cells lacking the

Abstract/Central Question: The term epigenetic refers to inheritance by non-genetic means. It is frequently assumed that changes in DNA packaging can be epigenetically inherited, which may lead to the inheritance of acquired gene expression states. DNA wraps around histones, much like a thread around a spool, to form nucleosomes. By organizing DNA in nucleosomes, our genomes are compacted, allowing 2 meters of DNA to be stored within every cell in our body. We recently observed that diploid yeast cells lacking the nucleosome assembly factor Asf1, partition into three subpopulations. In one population both alleles (i.e. copies) of the same gene are expressed equally, whereas in the other two populations one of the two alleles is two-fold up-regulated relative to its sister allele. This up-regulation is inherited through many generations. We will investigate whether this phenomenon is due to a permanent genetic defect caused by the absence of Asf1, such as chromosomal or gene duplication, or whether the phenomenon reflects the epigenetic inheritance of an abnormal expression state. These studies are likely to be broadly significant: Asf1 is conserved in humans, and implicated in cancer. Furthermore, perturbations of epigenetic gene control and chromosome structure and number are also implicated in cancers.
Computationally-guided identification of residues conferring

The present proposal supports a long-term collaboration with Dr. Rachel Karchin’s laboratory (Johns Hopkins) that received SRG support two years ago. We analyzed TEM-1 beta-lactamase evolution under antibiotic pressure to identify functional interactions between amino acid positions. Our analysis uniquely evaluated the contribution of individual residues to antibiotic resistance and made predictions that were tested experimentally. This work is currently under revision for the journal Public Library of Science (PLoS) Computational Biology. Dr. Karchin and I plan to further refine our computational analysis and to extend our findings to other proteins of clinical relevance, specifically HIV reverse transcriptase (HIV RT). We would like new SRG support to show that we can complement a strain of E. coli deficient in DNA polymerase I with HIV RT in order to: 1) Characterize the level of antiretroviral resistance of individual HIV RT mutants. 2) Monitor the impact of individual drug-resistance mutations on replication fidelity HIV RT, since virulence is tied to the error-rate of the reverse transcriptase. Monitoring the evolution of resistance to antiretroviral therapy has become a public health priority. Our work can help define marker mutations to use in these epidemiological studies and anticipate mutations that may arise in the future.
The social and genetic mating system of the Brewer’s Blackbird

I propose to study the social and genetic mating system in a non-territorial bird species, the Brewer’s blackbird. Prior to the advent of molecular parentage techniques, biologists assumed that social partnerships during the breeding season also reflected the mating patterns. A wealth of genetic studies now reveal a disconnect between social and genetic mating systems, but we do not yet understand this disconnect. Brewer’s blackbirds, the common bird at Santa Cruz bakeries, provide an ideal species for exploring how social patterns link to genetic patterns. They are unusual in being highly social during the breeding season—most songbirds defend nesting territories, whereas Brewer’s blackbirds nest in loose nesting colonies. This lack of territoriality allows us to more directly link social interactions to the genetic mating system, and preliminary observations suggest that these blackbirds have a rich and complex pattern of breeding social organization. The blackbirds are also resident year-round, which offers a rare opportunity to link winter social behavior to breeding social behavior. Finally, a color-banded population of these birds in an urban setting makes it possible to include a citizen science component to the study—we will recruit the public to report on locations of our banded individuals.
Arsenite-dependent anoxygenic photosynthesis in hot spring bacteria

We propose to investigate a newly identified form of photosynthesis that “splits” arsenic instead of water for photosynthesis. Arsenic-based phototrophy was recently discovered (2008) in arsenic rich hot spring microbial mats in Mono Lake, CA. Arsenic in the form of arsenite gives up electrons to the photosynthetic system allowing light to excite those electrons to drive cellular energy production. Unlike the typical photosynthesis of a plant or cyanobacterium, arsenic-based photosynthesis is strictly anaerobic process and thought to be an early form of microbial metabolism predating the rise of molecular oxygen, which occurred nearly 3 billion years ago. We hypothesize that the enzyme responsible for arsenic-based photosynthesis (called ArxA, arsenite oxidase) holds important evolutionary clues about the origins of other “modern” forms of arsenic-based metabolism such as the ArrA pathway responsible for non-photosynthetic respiration of arsenic. My lab has investigated this latter metabolism for many years mainly in the context of groundwater pollution and “normal” environments. Currently the only bacteria known or suspected of utilizing ArxA were isolated from Mono Lake. The research aims are to generate molecular and ecological data about the occurrence of arsenic photosynthesis in a model phototroph and survey other hot spring environments for ArxA-containing photosynthetic bacteria.
Characterization of Tra2B in murine brain development

Alternative pre-mRNA splicing is a prolific regulatory mechanism for expanding the protein output of mammalian genes. Alternative splicing is used extensively in the brain to regulate diverse functions such as synaptic communication, neuronal differentiation and cellular growth and proliferation. Surprisingly little is known concerning how alternative splicing is regulated during brain development. This is a significant knowledge gap because alternative splicing is proving amenable to pharmacological manipulation. We believe a deeper understanding of the mechanisms regulating alternative splicing during brain development will provide novel opportunities to treat neurological disorders. The long-term goal of our proposed research is to uncover alternative splicing decisions regulated by the conserved alternative splicing factor Transformer 2B (Tra2B) during brain development. Our preliminary data suggests that Tra2B plays a role in neuronal stem cell proliferation or differentiation. Here, we will test this hypothesis by generating mice in which Tra2B in genetically ablated only in specific cell types implicated in development of the cortex. Seed funding from COR will enable our labs to merge our respective areas of expertise and generate the preliminary data required to compete for significant extramural funds from sources such as the National Institutes of Health.
Probing the biophysics of intracellular motion by microinjection.

Cells, with hundreds of essential internal parts, expend energy to move those parts into arrangements that satisfy moment-to-moment needs. We will determine how force-generating molecular machines (motor proteins), by moving intracellular objects rapidly along filamentous tracks, can generate large-scale streaming motions in the fluid that surrounds those tracks. Using Drosophila oocytes as an experimental model system, we also will learn how motors drive self-organizing sinusoidal waves in groups of filaments that enhance microfluidic mixing. This mixing is an important part of organizing the oocyte interior such that a viable embryo will develop after fertilization. We have developed a mathematical model to explain various aspects of the behavior of the filaments and the streaming fluids. We would like to test that model by supporting a talented Physics/English undergraduate (Anthony Bielecki) with NIH funding during the Summer. He will microinject oocytes with fluorescent particles whose motions during streaming can be tracked accurately, and with drugs that change the stability and stiffness of the filament tracks. Purchase of a micromanipulator and microinjection system for shared use in the Life Sciences Microscopy Center is requested.
Asia’s New Middle Classes

Although largely ignored by scholars, the rising power of new Asian middle classes (AMCs) is transforming the region, the global economy and the future of the biosphere. This collaborative project will address the consequences arising from the demographic transformation of Asia into a network of globally integrated urban manufacturing and service centers. The shift in population from rural to urban situations has created new educated, technocratic and professional classes, an enterprising sector of flexible small scale producers and service providers, and, most importantly, the efflorescence of civil society groups representing democratic reform, women’s interests, environmental protection, consumer protection and legal reform. By focusing on China, India and Indonesia-Malaysia, our research will focus on the similarities and differences among Asian civil society groups, the significance of inter-regional exchanges and collaborations, the role of inter-regional migration networks, and the differential impact of religion, ethnicity, and culture on the AMCs definition of the “nation”. Our methodology will combine empirically grounded field work among civil society groups an analysis of how discursive practices combine innovation and memory, and a comparative historical analysis of how the new AMCs are reconceptualizing their “national identities” as they pursue greater political representation and sustainable development.
The proposed project would support on-going NSF-funded research on the origins of glaze-painted pottery in the Rio Grande Valley, from the perspective of Tijeras Pueblo, New Mexico. In particular, it would provide travel reimbursement (car mileage) and one quarter of .50 FTE GSR funding to conduct chemical characterization studies of ancient glaze paints on pottery sherds from the UNM Maxwell Museum's archaeological collections from Tijeras Pueblo on the electron microprobe at UC Davis. Funding for this analysis (at UCSC) was provided in the PI's current NSF grant. However, the electron microprobe at UCSC is no longer in functioning order and there are no plans to repair this equipment. Staff assigned to maintain this research equipment, to help prepare samples, and to train and assist researchers have been laid off. Therefore, this analysis will now need to be conducted at UCD. This change will incur greater costs in terms of travel to/from Davis and delay analysis into next Fall (2011), after funding for GSR support in the NSF grant runs out.
Santa Cruz Wharf Coastal Energy Research Facility: Bird Strike

The Coastal Energy Research Facility (CERF) is organized under the Center for Sustainable Energy and Power Systems (CenSEPS) on campus. The first CERF project is underway in collaboration with the City and County of Santa Cruz under the Climate Energy Compact of 2007. This project will install and operate a demonstration and sensor testbed for renewable energy on the Santa Cruz Wharf Headquarters roof to support the goal of making the Santa Cruz Wharf energy self-sufficient. The testbed includes the first wind turbine to be permitted by the California Coastal Commission on the California coast. Pursuant to the project’s permit conditions, a bird strike research and monitoring plan is required to be implemented. We propose a one-year project to monitor, document and report the interaction of birds with the 1 KW vertical axis wind turbine component of the CERF experimental testbed. Since no research exists on interactions between this type of wind turbine and birds, implementation of our plan will produce the first data and analysis on these dynamics. It will allow compliance with Coastal Commission requirements and thus, a significant step toward an energy self-sufficient wharf in Santa Cruz and an example to other coastal communities in sensitive environments.
Collaborative Research: Addressing Indigenous Cultural, Economic,

Since 1992, I have conducted research with Native Amazonian communities in Ecuador, raising over $2 million in extramural funding. This research has examined complex socio-ecological systems and human/environment interrelationships from a variety of theoretical perspectives, from common property theory and indigenous market integration to biocultural change. A critical limitation of my work, however, is the fact that in all these years, the research topics, questions, and hypotheses have come from the top-down and not the bottom-up. In this proposal, I ask for support to gather some unusual data: I propose 2-3 day community participatory brainstorming sessions in seven indigenous communities to ascertain what Huari, Cofán, Kichwa, and Shuar residents identify as pressing research needs, and to converse about how to bridge these concerns with my research skills and existing longitudinal data to address contemporary human and environmental crises in the Ecuadorian rainforest. The impact of such an effort is at least two-fold: it fosters research that is locally resonant, relevant, and rigorous, altering traditional power dynamics between “investigator” and “subject.” It reinforces the importance of community-based research and builds upon UCSC’s ongoing efforts to support collaborative research (e. g., CCREC).
The Cana Archaeological Project: Cities and Hinterlands in Atlantic

The study of urbanism has been a central focus of archaeological analysis for more than a century. However, precolonial West African cities have only recently been considered in this discussion. Since 2000, I have led an archaeological campaign to explore the nature of urbanism in the precolonial Kingdom of Dahomey, located in the Republic of Bénin. From 2000-2003, the Abomey Plateau Archaeological Project adopted a landscape perspective to examine the regional dynamics of Dahomean royal palace building campaigns in the era of the slave trade. Between 2007 and 2010, the Cana Archaeological Project initiated regional survey and targeted excavations at Cana, an important palatial center in Dahomey. This ongoing project seeks to understand the evolution of West African cities in the Atlantic Era, focusing on the dynamics of ‘internal’ African slavery, and the shifting nature of community identity in precolonial Dahomey. This proposal seeks funds to support the archaeological analysis of materials (faunal, organic, ceramic) collected in previous seasons of archaeological research. I also request funds (in lower priority) to support advanced training in geospatial technology.
Young children’s use of new communication media and the effect on

Computers are now an integral part of the lives of preschool children, but we know relatively little about their use and impact. Emerging research on computer technology in education and early child development has focused on computers as learning aids and instructional devices. Instead, our research focuses on computers as communication devices, that is, using the computer as a way to talk to others rather than to provide information or entertainment. We ask how computers affect 1- to 4-year-old children’s communication with others, and how the use of computer-mediated communication influences the development of cognitive and communicative abilities. In particular, we will focus on video-mediated communication (e.g., Skype). We will (1) establish empirical evidence on the use and characteristics of video calls by young children; (2) assess developmental outcomes of this usage, specifically on whether experience with video calls facilitates the development of various key cognitive and communication skills; and (3) examine the effect of technology advances.