Abstract Review
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The University of Arizona
Graduate College
19th Annual Undergraduate Research Opportunities Consortium (UROC) Conference

Summer Research Institute
Minority Health Disparities (MHD)
Maximizing Access to Research Careers (MARC)
Hooked on Photonics
Integrated Optics for Undergraduate Native Americans

Biosphere 2 - Research Experience for Undergraduates
Biosphere 2 - Environmental Science Internship Program
Student Affairs Research Program
UROC - PREP
CAT Vehicle / Electrical and Computer Engineering Research Experience for Undergraduates
Summer Research Institute
Program Director: Donna Treloar, MA

Summer Research Institute, funded by the University of Arizona, is open to juniors and seniors of all disciplines, including social science, humanities, fine arts, and STEM. SRI accepts students from other universities as funding is available.
AbSTRACT: Individuals raised in adverse environments are believed to exhibit stress-induced cognitive deficits that result in high-risk, unconventional behaviors. These behaviors contrast with societal expectations and thus are viewed as disruptive and deviant. As such, many of the existing educational intervention programs directed at these youths seek to correct their high-risk behaviors to align with conventional standards and expectations, often to no avail. The current study seeks to address recent research suggesting that cognition may in fact be altered in high-risk individuals, rather than simply disrupted. Review of the research highlights the role stress plays in the development of survival strategies and cognitive control. Additionally, studies have demonstrated that certain skills may actually be enhanced within a stressful context. An emerging theory suggests that the cognitive abilities and behaviors observed in high-risk youths may reflect adaptations necessary for survival in an unpredictable environment. This theory is experimentally assessed using the Probabilistic Selection Task, a trial-and-error, rule-based learning approach to measuring cognition, to test low-stress and high stress subjects. It is hypothesized that high-stress individuals will exhibit specific and opposing effects on cognitive inhibition and shifting as a result of their exposure to chaotic and unpredictable early life events. Our hope is that this research will spur the development of improved intervention initiatives that will cater to the unique needs of youths raised in high-risk environments rather than attempting to fix what may not be broken.

Keywords: stress, environment, cognition, adaptive, rule governance.
**University of Arizona**
Tucson, Arizona

**PI: Dr. Ronald L. Heimark**

**Regulation of Nuclear β-Catenin by ARF6**

**Abstract:** Pancreatic cancer has the highest percent mortality rate out of any cancer. The main reason for only a 6% survival rate after 5 years of initial diagnosis is because pancreatic cancer invades and metastasizes early. The purpose of this study is to understand how pancreatic cancer cells invade and metastasize. Our research focuses on the relationship between two proteins that have been implicated in metastatic signaling pathways of other cancers: ARF6 and β-catenin. In melanoma, ARF6 and β-catenin are implicated as participants in canonical Wnt signaling. In the melanoma Wnt signaling pathway, ARF6 disrupts adherens junctions and liberates β-catenin into the cytoplasm and allows for it to be translocated into the nucleus. Once in the nucleus of the cell, β-catenin combines with transcription factors to promote cell proliferation, thus causing invasion and subsequent metastasis. Our research shows that in pancreatic cancer cells, ARF6 has a role in both increasing and decreasing the nuclear concentration of β-catenin, depending on the levels of ARF6 within the cells. This information suggests that ARF6 has a role in both the amplification and determent of Wnt signaling and metastasis in pancreatic cancer cells.
PI: Dr. Hector Quijada

PDGFR-B INHIBITOR AS AN INFLAMMATION REDUCTION AGENT IN ACUTE LUNG INJURY

Abstract: Severe inflammation is a hallmark in acute lung injury (ALI), and it is pejorative inflammation that often upgrades acute lung injury to the high-fatality diagnosis of ARDS. Because of this, treating inflammation in ALI by way of inhibiting the PDGFR-B promoter has become an attractive target for treating ALI itself. Prior unpublished studies have demonstrated the PDGFR-B inhibitor’s success in reducing inflammation, and the current study hypothesized that treating lipopolysaccharide (LPS) induced murine lung injury with the PDGFR-B inhibitor would reduce inflammation by manipulation of the G-quadruplex. LPS and PDGFR-B inhibitor were injected to mice and lungs were harvested 18 hours following onset of inflammation. Inflammation was then assessed using BAL protein levels and cell differentials. Results showed a decrease in PMN’s/inflammation in PDGFR-B inhibitor treated mice.
Does starvation affect energy allocation to different body parts?

Abstract: Nutrition obtained in ontogeny affects the development of later adult forms. This allows for an adaptive response to an environment and has evolutionarily shaped organisms with the ability to specialize when in the adult forms. When resources are scarce, organisms make critical decisions in resource allocation and trade-offs take place between different organismal functions. For most insects these three functions are sensory (head, antenna), locomotion (thorax, legs, wings), and reproduction/storage (abdomen). Since organismal function dictates species survival strategy it is expected that the most important of the functions will have the greatest amount of resources. We tested this by starving larvae of Manduca sexta and examining resource allocation in adult forms. Four different treatments were tested, male and female fed high quality diet and low quality diet with both diet treatments being starved once larvae reached 6 grams. Energetic values were obtained with a bomb calorimeter for each of the body parts mentioned above. It was found that males and females allocated their resources differently in respect to different body parts. As for the different nutritional treatments, larva raised on high quality diet allocated resources differently when compared to those on low quality.
Sensitivity of Future Accelerators for Vector-Like B Quark Pair-Production

Abstract: Vector-like quarks are particles predicted by many as possible solutions to the current hierarchy problem with the mass of the Higgs Boson. The Large Hadron Collider will be upgraded in 2015 with the potential of accelerating particles at nearly double the energy as before and so it is possible that these particles could be discovered. Using Monte Carlo data samples representative of the higher energies to be produced at the upgraded LHC, an analysis is performed to determine how sensitive it would be for massive vector-like quarks. Here the selection process is optimized for the $B \rightarrow Hb$ decay state for mass points of 1000 and 1500 GeV. After the initial data cuts, the data is then run through a boosted decision tree to further reduce background noise and then sensitivity is measured by finding what models could be excluded within 95% confidence limits. The initial results show that for a mass of 1000 GeV there would be high discovery potential for vector-like quarks no matter what the decay branching ratios are, but for a mass of 1500 GeV there would only be discovery potential if the quarks decay to a few specific branching ratios.
EXCESSIVE MUTATIONAL LOAD FOUND IN PATIENTS WITH A FAMILY HISTORY OF CANCER

**Northern Arizona University**  
Flagstaff, Arizona

**PI: Dr. Christina Laukaitis**

**Abstract:** Inherited gene mutations can result in uncontrollable cell division that leads to early onset cancer. With the use of Next-Generation Sequencing (NGS) technology, individuals with cancer or a strong family history of cancer were tested to identify inherited mutation increasing cancer risk. Surprisingly, a few people were found to have more than one inherited gene mutation. We tested two hypotheses to explain this finding: (1) one inherited mutation could lead to the development of another in the germ line or the blood or (2) that the anomaly resulted from a high error rate in NGS technology. In the current study, DNA from two patients with multiple genetic mutations were amplified using polymerase chain reaction (PCR) followed by Sanger Sequencing to confirm the presence of the multiple mutations. As no genetic mutations were confirmed, the high error rate of NGS technology is thought to explain why these individuals were being identified with more than one genetic mutation.
JHAMERE HOWARD
SUMMER RESEARCH INSTITUTE

UNIVERSITY OF CALIFORNIA, DAVIS
DAVIS, CALIFORNIA

PI: DR. CELESTINO FERNANDEZ
LOVE DOMINOES: THE MATE SELECTION OF AFRICAN-AMERICAN WOMEN AT RESEARCH UNIVERSITIES

ABSTRACT: College-educated African-American women are struggling to find comparable counterparts in regards to intimate relationships while attending college. These women tend to be economically fit to produce intergenerational stability for wealth and education, yet as the African-American women enter the marriage market, several may not find eligible mates with similar levels of education, or find a mate at all. These single African-American women will either have to marry less than comparable counterparts (hypogamy), entertain other options or postpone marriage altogether. The results of those alternatives will reduce the likelihood of stable relationships and positive life outcomes for African-American families, while simultaneously reaffirming stereotypes perpetuated about African-American women’s impact on families. The results of this study gain more insight into the dating trends of African-American women in higher education, while exploring African-American women’s perspective on dating, marriage, their process when selecting a partner, and their strategies for dating in college. Understanding the meanings that African-American women attach to mate selection in college may illuminate the relatively low number of African-American women in relationships leading to union formation. Through 30 one-on-one in-depth interviews with African-American women at UC Davis and the University of Arizona, the researcher was able to analyze women’s subjective explanations, expectations, and process for selecting companions. The preliminary results obtained thus far point to the importance of family and culture related variables influence on expectations of future partners, in addition to highlighting the importance of race and ethnicity contributing to constraining the women’s dating pool.

UROC: Undergraduate Research Opportunities Consortium 2014
ABSTRACT: American Indian (AI) cancer survivors and their families living in rural areas of Arizona are most likely to encounter difficulties accessing cancer resources. These difficulties, often referred to as barriers, severely reduce the effectiveness of any type of care plan created for the cancer survivor. In our research, we used descriptive qualitative research methods to investigate the barriers and gaps in service. Our preliminary results are generated from a combination of individual interviews, focus group interviews, and open-ended questionnaires which were used to collect data. Our results are preliminary and include 5 of 12 target AI populations. The top barriers identified in our study included: transportation, lack of services, and systems issues. The top service gaps included caregiver, education for navigators/CHRs/caregivers, hospice, housing, and patient advocates. This research is ongoing and more data will be added as research progresses.
Abstract: What does New Conquest literature show about the religious conquest of Mesoamerica? This study used meta-analysis of relevant New Conquest scholarship on Mayan religious syncretism to identify commonalities and trends. Syncretism is the amalgamation, or attempted amalgamation, of two or more opposing ideas, schools of thought, or religions. New Conquest History is an umbrella term for the revised and edited histories of the Spanish conquest of Mesoamerica. It is different than the old conquest history in that the old conquest history had been focused more on Spanish and Latin accounts in a very top-down approach. The New Conquest History is more bottom up, taking focus away from elites and shifting it to natives and other protagonists such as minorities, women and Africans. How the New Conquest History is written is with the New Philology. The New Philology in a nutshell focuses more on native accounts and native language sources in conjunction with or in place of the Spanish and conquistadors accounts. The results of the meta-analysis have shown that natives and minorities played a more active role in the conquest and that the religious conquest of Mesoamerica was at best incomplete and at worst a failure. The current study applies the new philology to the Mesoamerican conquest but this methodology is applicable to other conquests, under-voiced populations and events.
Abstract: Dietary intake of micronutrients during childhood and adolescence has the potential to positively impact bone structure and strength and may decrease future risk of osteoporosis. We hypothesized that vitamin B-12, manganese, and phosphorus intake positively influence bone structure and strength in pre-and early pubertal girls. Methods Baseline data from 4th and 6th grade girls who participated in the “Jump-In: Building Better Bones Study” included bone structure and strength measurements, diet assessments, and body composition assessments. The Harvard Youth/Adolescent Food Frequency Questionnaire (YAQ) assessed micronutrient and energy intake. Bone structure and strength variables (i.e., femur and tibial length, area, circumference, and density) were measured by peripheral quantitative computed tomography (pQCT). Descriptive statistics were used to describe participant characteristics, such as BMI, and maturation offset. Bivariate Pearson correlations and linear regression were used to evaluate associations between bone measurement and selected micronutrient intake while adjusting for BMI, maturity offset, caloric intake, and physical activity. Results Descriptive characteristics are as follows: BMI percentile (mean + SD, 56.81 + 29.35) and maturity offset (mean + SD, -1.13 ± 1.05). Femur (p=0.015) and tibia length (p=0.016) had significant correlations with phosphorous intake. There were trends towards associations with femur diaphyseal cortical area (p=0.08) and diaphyseal tibia cortical area (p=0.06) to phosphorous intake also resulted. Linear regression revealed no significant associations between bone structure and strength measurements to selected micronutrient intakes after adjusting for covariates. Conclusion The micronutrients selected for this analysis were not associated with bone structure and strength in 4th & 6th grade girls. However, these micronutrients may play an important role in other aspects of bone development. Additional studies, both cross-sectional and longitudinal, need to be performed to elucidate the role of these nutrients in bone development in adolescent girls.
Abstract: Under the provisions of the Affordable Care Act, it is predicted that Medicaid enrollment will surpass the number of available physicians accepting Medicaid patients. Therefore, the question remains: will there be enough physicians available to provide services to these new Medicaid patients. Arizona is one of the states that have recently expanded their Medicaid program: AHCCCS. This study will examine the physician participation rate in AHCCCS in the large urban cities in Maricopa County. The data sources used was the 2013 licensed physicians from the Arizona State Board of Allopathic Medical Association for MDs and from the Arizona Osteopathic Medical Association for DOs and the AHCCCS health plans. However, due to time constraint not all of the health plans were covered. In Maricopa County, there are 8,669 physicians practicing, but the three health plans covered 1,661 physicians. Of these physicians participating in AHCCCS, about half (50.7%) are primary care physicians, 13.5% are OB/GYN, and 35.8% are specialists. Physicians in Peoria are more likely to accept new AHCCCS patients in Maricopa County. In comparison, 93.4% of physicians in Scottsdale are unlikely to accept new AHCCCS patients. These findings are preliminary. The study does not provide an accurate representation of physicians accepting new AHCCCS patients and those who are participating in Maricopa County. Completion of the nine health plans will provide better results to make a comparison with the national acceptance rate and the national participation rate.
Abstract: Abandoned mine tailings are a worldwide problem, especially in the highly mined regions of the world. In the United States there approximately half a million abandoned sites. This is a problem particular for Arizona that house about 24,183 abandoned mine sites. Mine tailings are uneconomical waste byproduct from the mining industry. Tailings contain a variety of toxic metals depend on the mineralogy of the site, such as lead, arsenic, zinc, mercury, copper, manganese, cadmium and chromium. Toxic elements are an environmental and human health hazard, contaminating the surrounding through water erosion and wind dispersion. Our study site, the Iron King Mine Tailing at Central Arizona provide a low quality for plant growth due on the semi-arid environment. Over a four year of plant based stabilization study, we will be able to understand how a plant based assistant affects plant availability of metals, tailings pH, organic and nitrogen content with depth. Our preliminary results suggest that over the course of four years pH will be drive by the oxidative weathering, not for the plants.
Abstract: The ability to reach the attosecond time frame provides novel access to imaging electrons. Changing the high harmonic generation geometry can optimize the interaction zone between the laser and gas and increase the efficiency of attosecond spectroscopy. Three geometries have been used in high harmonic generation: gas jets, waveguides, and semi-infinite gas cells. Since the literature has not quantitatively compared the waveguide and semi-infinite gas cell, we present data comparing the two geometries within the same laser setup. The laser used for the experiment regularly utilizes a waveguide, and a gas cell was configured using an ultra-torr tee, glass tubing, aluminum foil, washers, and o-rings. The spectrum of the intensity as well as the stability of each geometry is presented. Preliminary results show the semi-infinite gas cell to yield approximately 60% higher intensity than the waveguide. Conversely, the waveguide maintains more stable high harmonic generation. As further information on high harmonic generation geometries is obtained researchers can tailor their experimental setup and consequently expand the applications of attosecond spectroscopy.
Andrew Sikorsky
Summer Research Institute

University of Arizona
Tucson, Arizona
PI: Dr. John A. Szivek

Comparison of Stiffness Properties of Biomimetic Scaffolds and Sheep Bone that the Scaffolds Will Replace

Abstract: Resection of large segments of bone due to bone cancer or trauma leads to situations for which there is currently no adequate treatment. Biomimetic synthetic scaffolds made from polybutylene terephthalate and infiltrated with calcium particles and stem cells extracted from patients could potentially be used to support patients while bone formation occurs filling the porous scaffolds and regenerating the segment. The most effective scaffolds will have stiffness less than normal bone but mechanical strength characteristics that are sufficient to provide support during segment regeneration. Scaffolds have previously been developed that are strong enough to support a sheep when placed into the femoral mid-diaphysis but stiffness characteristics have not been evaluated. In this study the stiffness of sheep femora in the region to be used for implant will be compared to the stiffness characteristics of unsterilized and sterilized biomimetic scaffolds. Specimens will be instrumented using electrical resistance strain gauges and will be loaded using a mechanical testing system (MTS). Scaffolds exhibited an axial stiffness of 1.16 GPa on average, while sheep bone exhibited an axial stiffness of 18.25 GPa on average. Since the scaffolds have a substantially lower axial stiffness they are expected to encourage bone formation by passing appropriate sized loads through the cells that will form bone in the pores of the scaffolds.
Abstract: Previous research has demonstrated rapid statistical learning in infants, but few have examined infants’ long-term memory ability. The hippocampus, a structure important for rapid learning and long-term memory, does not fully emerge until 2 years, suggesting that young infants may rely on slower cortical memory systems. To investigate the progression of long-term memory as the hippocampus develops, the current study tests three age groups: 10 month-olds (pre-hippocampal), 21 month-olds (emerging-hippocampal), and 6 year-olds (hippocampal). While hippocampal learning is strengthened by neural replay, a process occurring during sleep dependent on the development of the hippocampus, infants learning cortically may not benefit from sleep due to lack of hippocampal connectivity. In examining how the connectivity of the hippocampus impacts memory benefit from sleep, participants will be tested after a delay: half will remain awake and the others will sleep. To distinguish cortical from hippocampal learning, participants will be tested on forwards and backwards words after exposure to a statistical language sequence; the hippocampus is sensitive to only forwards order within associated pairs (AB), but cortical learning structures are not sensitive to ordering (accepts both AB and BA). If participants distinguish between these test items, it is likely that the words were encoded hippocampally. Inability to distinguish forwards from backwards items would be indicative of cortical learning, expected in the 10-month olds. No difference between sleep and wake in the youngest group is expected, while older groups may show stronger discrimination after sleep, indicating cortical learning in infants and hippocampal learning in kindergarteners.
Abstract: Lack of knowledge regarding community engagement in research has created the need for further research on the definition of the community engagement model. The purpose of this small pilot study is to define and describe community engagement from the perspective of academic and indigenous community leaders and to compare/contrast these perspectives in a very limited and select population in Arizona. Individual interviews were implemented to collect data to help define community engagement and to determine the similarities and differences between these two perspectives using the content analysis method.
WASHTONGN STATE UNIVERSITY - PULLMAN
PULLMAN, WASHINGTON

PI: DR. NOLAN L. CABRERA

THE EDUCATIONAL BARRIERS AND COPING STRATEGIES OF LATINO MALE UNDERGRADUATES AT THE UNIVERSITY OF ARIZONA

Abstract: The purpose of this study was to analyze the educational barriers and coping strategies of Latino/a undergraduates to better understand why Latino males seek less help than Latina females at the University of Arizona. Latino/a undergraduates participated in in-depths interviews and were selected based on their extensive involvement in Latina/o-based organizations on campus such as Chicano/Hispano Student Affairs, Latina/o Greek life, MECHA, etc. The data was analyzed based on the diverse perspectives of masculinity described by Mirande (1998), Connell (2005), and Abalos (2002). The findings concluded that Latino/a undergraduates at the University of Arizona shared similar educational barriers consisting of lack of one-on-one faculty interaction and lack of sense of belonging. Major differences emerged in the coping strategies and help-seeking behaviors for both genders. All Latina females sought help from family, peers, faculty, and alumni when struggling socially or academically while most Latino male undergraduates did not seek help due to fear, pride, and over-reliance on themselves. Abalos (2002) explains this with his view on masculinity that states that “stories of patriarchy” are told, retold, and reinforced in the Latino culture which inflicts wounds on Latino males because they never question traditional views but instead abide by them. In order for Latino male undergraduates to seek help when struggling academically or socially, a comfortable campus climate and interactions with faculty are essential. A combination of different policies and practices focused on the Latino male can help increase help-seeking behavior, retention rates and degree completion for Latino men in higher education.
EVALUATION OF MONOMER CHAIN LENGTHS FOR STABILIZATION OF BLACK LIPID MEMBRANES VIA POLYMER SCAFFOLDING

University of Puerto Rico - Mayagüez Campus
Mayagüez, Puerto Rico

PI: Dr. Craig Aspinwall

University Research Opportunities Consortium 2014

Abstract: Biosensors are used for rapid screening of biologically active compounds in the blood and for rapid diagnosis of diseases. We are developing next generation biomimetic sensing technologies based on Black Lipid Membranes (BLMs), a synthetic mimic of the cell membrane environment. Though BLMs provide a useful medium to incorporate membrane proteins in sensors, they are inherently unstable and typically rupture in <4 h. Thus, there is an urgent need to improve BLM stability to realize biomimetic sensors. To overcome this problem, we doped BLMs with either glycidyl methacrylate (GMA) or hexyl methacrylate (HMA) and the cross-linker ethylene glycol dimethacrylate (EGDMA) and polymerized using UV radiation to evaluate the influence on BLM stability. The conductance of GMA-doped BLMs decreased by approximately 50% after polymerization and the electrical stability, measured as the potential at which the BLM breaks down, increased by >5-fold suggesting that the stability of BLMs is improved. For HMA-doped BLMs there was no significant change in the electrical stability suggesting that a polymer scaffold consisting of HMA and EGDMA does not improve the stability of BLMs. To investigate the effect of monomer doped BLM on ion-channel activity, α-hemolysin, a pore forming bacterial toxin, was reconstituted in the GMA-doped BLMs. The conductance of the ion channel (~0.8 nS) was maintained before and after BLM polymerization. This study finds that doping BLMs with GMA/EGDMA dramatically increased the electrical stability, suggesting that this could be utilized to increase BLM longevity for biosensor development.
PROGRAM STAFF AND SPONSORS

SUMMER RESEARCH INSTITUTE (SRI)
Coordinator: Donna Treloar, MA
Instructors: Jose Manuel Cortez, Renee Reynolds
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Coordinator: Stephanie Adamson
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PIs: Nasser Peyghambarian, PhD; Allison Huff Mac Pherson, D.H.Ed.
Coordinator: Ameé Hennig
Sponsors: National Science Foundation (NSF). Funding for this research was provided by the NSF Grant No. #EEC-1359163

BIOSPHERE 2
PIs: Mitchell Pavao Zuckerman, PhD; Katerina Dontsova, PhD
Sponsors: National Science Foundation Research Experiences for Undergraduate Program

STUDENT AFFAIRS RESEARCH PROGRAM (STAR)
Coordinator: Nura Dualeh, MA
Instructors: Andrew Huerta, PhD, Jose Manuel Cortez, MA, Renee Reynolds, MA
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UROC-PREP
Coordinator: Donna Treloar, MA
Instructor: Andrew Huerta, PhD,
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PI: Jonathan Sprinkle, PhD
Coordinator: Nancy Emptage
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PI: Margaret Briehl, PhD
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