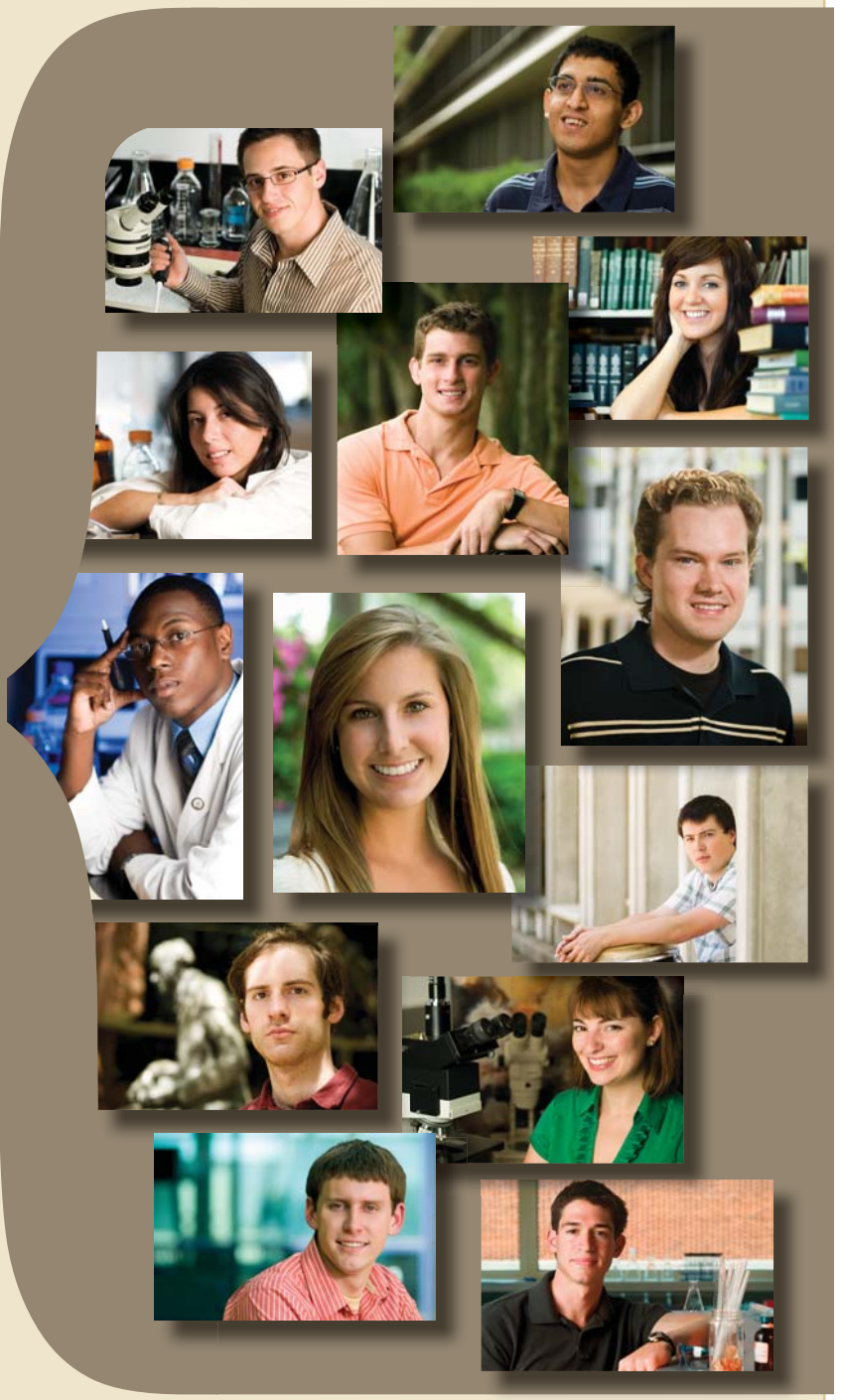
Division of UNDERGRADUATE Studies

Undergraduate Research and Creative Activity Award Symposium

September 29, 2009

College of Medicine, Florida State University

5:30 p.m. to 8:30 p.m.



The Undergraduate Research and Creative Activities Awards (URCAA) award students $4,000 to conduct a summer research project or creative activity under the direction of a faculty mentor.

The Mentored Research and Creative Endeavors Awards (MRCE) award students $1,000 to conduct a summer research project or creative activity under the direction of a faculty mentor.

D. Craig Filar, Ph.D.
Director, Office of National Fellowships

Cathy Levenson, Ph.D.
Director, Undergraduate Research and Creative Endeavors
Associate Professor, Department of Nutrition, Food, and Exercise Sciences & Program in Neuroscience

Welcome to the 2009 Undergraduate Research and Creative Activity Awards Symposium! Tonight we celebrate outstanding undergraduate research. The students who will present their summer projects tonight have enhanced their undergraduate experience by taking on directed research and creative activity under the supervision and mentorship of some of Florida State University's most esteemed faculty.

This event culminates the URCAA experience, but the work these students present tonight doesn't end here. Many of the awardees will continue their intellectual pursuits through honors theses, independent study projects, and graduate research and creative work. Similarly, the fruits of their labor will not be confined to the FSU community. The Florida State University funded research and creative activity will likely continue to take the stage through academic conferences, scholarly journals, and art showcases, festivals and competitions.

Throughout the atrium you will find posters showcasing the fascinating research endeavors by student recipients of the Mentored Research and Creative Endeavors Award through the Office of Undergraduate Research and Creative Endeavors. This evening's oral presentations are presented by students awarded research funding through the Office of National Fellowships.

If you're attending this event as a student, we hope you'll be inspired to explore your own scholarly interests. We are pleased to provide you advanced access to the Summer 2010 URCAA application, which you can pick up in the atrium tonight or online at http://onf.fsu.edu.

We hope that this award has allowed its recipients unparalleled opportunity and support to investigate their academic interests while also serving as a vehicle for intellectual self discovery.

Claudia Avalos is a premedical student majoring in Biochemistry and Biomedical Mathematics. She began her research through the Women in Math, Science, and Engineering living, learning community (WIMSE) with Dr. Nick Cogan in the Department of Mathematics. She submitted a paper for publication on her past research and is currently part of a project in the Dudley Organic Chemistry Lab.

Conrad Gleber, a senior biochemistry major, is attempting to design and test a new approach to bactericidal therapies. He hopes that his research will lead to a new, more powerful line of medicines that will prevent the increasing problem of antibiotic drug resistance. In addition to the Undergraduate Research and Creativity Award, Conrad has also been awarded the Bess Ward Honors Thesis Award, and the Charles and Louise Brautlecht Scholarship in Chemistry for his strides in drug discovery.

Justin DeBrabant is a Computer Science and Pure Mathematics double major entering in his senior year at Florida State University. His research was conducted with the guidance of Dr. Feifei Li with whom he worked for over a year. After FSU, Justin plans to pursue his Ph.D. in Computer Science.

Jared Doster is a physics major and has been conducting research at FSU's superconducting linear accelerator with Dr. Ingo Wiedenheover since his freshman year. His future plans are to study physics and biology in graduate school in order to pursue a career in computational neuroscience research.

In his pursuit of BA degrees in music and Latin American studies, **Travis Eales** has had the opportunity to study a broad range of musical cultures in the classroom and abroad. His interests include the music of the Caribbean, jazz, ethnic tensions in music, and musical healing. Upon graduation, Travis plans to pursue graduate study in ethnomusicology.

Alan Kuhnle is a fifth-year undergraduate at Florida State studying mathematics. After graduation, he will pursue a Ph. D. in mathematics, with the ultimate goal of a career as a research mathematician. His awards include the 2009 Barry M. Goldwater scholarship.

Jeremy Bary was born and raised on the island of St. Maarten, where he graduated from The St. Maarten Academy as valedictorian. He is pursuing a Bachelor of Science in Biology. Upon graduation, Jeremy plans to design effective business models that will reduce health care costs while enhancing quality care.

David Mari is an undergraduate at Florida State University currently pursuing a Bachelor of Science degree in Biological Science. He aspires to attend an M.D.-Ph.D. program to earn a Ph.D. in Genetics and Molecular Biology, and, following medical school, train to become a retinal surgeon.

Marlee McCleary is a senior International Affairs major with a minor in women's studies. She is interested in international human rights, specifically gender equality and women's empowerment in developing nations. She strongly believes in the power of experiencing other cultures and has been able to combine her love of travel and specific research interests with an FSU Serviceship and a URRCA award.

Suchandan Pal is a Junior in the Pure Mathematics Program at Florida State University. His interests include some sports, mathematics and a variety of other pastimes.

Kim Reuter was born in Germany, and she spent her childhood in England and the United States. Pursuing a double major in Biology and Dietetics, Kim has participated in several different research opportunities and plans to attend graduate school upon graduation in the fall of 2009.

Kaitlyn Suveg is a senior in the College of Social Work, and is currently completing her field placement in Orlando, FL. Her interests include adolescent addictions, community-based practice, meshing the arts with clinical practice, and international social work. Upon graduation, Kaitlyn plans to pursue her Masters in Social Work.

John Walsh is originally from Bradenton, Florida. Currently a senior pursuing a degree in chemical engineering with a major in biomedical engineering, he has been working on magnetic resonance imaging research with Dr. Sam Grant. John will graduate in spring, 2010, after which he will attend graduate school to further his study of biomedical engineering.

ATRIUM

5:30 - 6:00 p.m. ***Poster Presentations***

6:00 - 6:30 p.m. **Reception and Welcome**

by Dr. Lawrence G. Abele, Provost and Executive Vice President for Academic Affairs

6:30 pm / Room 1301

The Effects of Microfinance on Kosovar Women

Marlee R. McCleary

Supervising Professor: ***Dr. Will Moore***

Do microloans help women develop a greater sense of empowerment with respect to: their control of economic resources; their expression of self-esteem; their role in decision-making; and their ability to negotiate with others? Many microfinance institutions have increased their female clientele due to observations that women not only have a better repayment rate than men, but also use loans more effectively. Unfortunately, this evidence may suffer from selection bias in research design. To determine whether these observations are valid, I conducted field research in July, 2009 in Kosovo. A proper research design requires comparison between women who received microcredit loans and those who did not. In addition, I compare women who started businesses without receiving microcredit to those who relied on microcredit to start their businesses. This design permits valid conclusions. I interviewed a sample of 19 Kosovar women, and preliminary analysis of the interviews suggest that while having an entrepreneurial spirit is associated with higher levels of empowerment, receiving a microloan is also positively associated with empowerment, even controlling for entrepreneurial spirit. This is an important result because it demonstrates that the widely reported positive association between microcredit and empowerment of women does not necessarily suffer from selection bias. Although my study focuses on a sample of Kosovar women, the results may well generalize to the population of all women.

6:30 pm / Room 1302

Expression Analysis of Rod Photoreceptor Regeneration

David Mari

Supervising Professor: ***Dr. James Fadool***

Photoreceptor degeneration is a common cause of inherited blindness worldwide. Therapies for retinal degenerative diseases may directly benefit from studies of lower vertebrates, such as zebrafish, which exhibit persistent neurogenesis and the capacity for photoreceptor regeneration. Previous studies from this laboratory have identified numerous genes with dramatic changes in expression during photoreceptor regeneration. The objective of this report is to identify those genes that are potential mediators of photoreceptor development. The expression patterns of a subset of genes were characterized by in situ hybridization in embryonic zebrafish and on histological sections of the retina from wildtype fish and a transgenic line of zebrafish demonstrating continuous rod regeneration. The expression pattern for the stem cell gene sox11b showed considerable labeling of the developing

zebrafish retina. In adults, increased labeling was observed in the retinal photoreceptor layer undergoing regeneration. These data suggest that sox11b is an important mediator of photoreceptor development and regeneration. These studies provide novel insights into the molecular properties of neural stem cells and progenitor cells.

6:55 pm / Room 1301

The Characterization of SCC4 in Sister Chromatid Cohesion and Recombination

Jeremy Bary

Supervising Professor: *Dr. Hong guo Yu*

When cells divide, chromosomes, which carry all of our genetic information, separate equally to opposite sides (poles) of the cell. Equal separation requires that sister chromatids (original and copy) remain cohesive prior to separation. A protein complex known as cohesin provides cohesion between sister chromatids during mitotic and meiotic cell divisions. In order to establish cohesion, cohesin must be loaded onto the chromosomes; loading requires a protein known as sister chromatid cohesion 4 (Scc4). This project is focused on elucidating the function of Scc4 during the process of meiosis in the model organism *Saccharomyces cerevisiae*. Because *SCC4* is an essential gene, we constructed an *scc4* meiosis-specific null allele which specifically depletes Scc4 protein in meiosis but not in vegetative cells. We have found that Scc4 is required for sister chromatid cohesion and meiotic nuclear division. Our observations indicate that Scc4 plays an important role in meiotic cell division.

6:55 pm / Room 1302

Enantioselective Rearrangement of Benzyloxypyridines

Claudia Avalos

Supervising Professor: *Dr. Gregory Dudley*

Many drugs that are used effectively to treat diseases have harmful side effects. This is because the synthesis of the molecules often results in two forms of the drugs known as enantiomers. However, the task of synthesizing only one enantiomer or even separating the two enantiomers from each other is rather difficult because both have the exact same formula, bonds, and chemical characteristics. Therefore, in order to prevent the side effects and to enhance the effectiveness of the drug, the active enantiomer must be synthesized through a reaction that makes it prevail over the other. A novel rearrangement reaction was discovered in the Dudley lab that transforms achiral ethers (benzyloxypyridines) into chiral alcohols by deprotonation using a strong base. Such reaction has the potential for being used for synthetic purposes in drugs that require high enantiomeric purity. Currently the research has led to testing the efficiency of selective deprotonation prior to rearrangement and the coordination of ligands during the reaction to yield the desired enantiomerically enriched products.

6:55 pm / **Room 1303**

Classification of Infinite Coxeter Systems

Suchandan Pal
Supervising Professor: ***Dr. Eriko Hironaka***

Familiar expressions such as "x+3" and "x^2 + 7x+2" are called polynomials and are fundamental objects of pure and applied mathematics. We can often describe some of the properties of a polynomial by a quantity known as Mahler Measure. In 1933 D. H. Lemher found a polynomial with Mahler Measure about 1.176 and asked if a polynomial with smaller Mahler Measure existed. Since then, despite numerous attempts, Lemher's Conjecture has remained unsolved. The purpose of this project is to find a polynomial with Mahler Measure less than ~1.173 or show that no such polynomial can exist. Large computer searches have been unable to find such a polynomial, and there is no mathematical proof that no such polynomial can exist. In 2002 McMullen showed that a large class of polynomials which come from Coxeter Systems do not have Mahler Measure smaller than Lemher's number. Our project was to extend McMullen's argument to a more general analogue of Coxeter Systems called Mixed Sign Coxeter Systems to furnish further evidence for the truth of Lehmer's Conjecture. We showed that a number of results used in McMullen's argument are no longer true in the case of Mixed Sign Coxeter Systems. Our work furnishes a number of initial results that begin to explore another approach to Lemher's conjecture.

7:20 pm / **Room 1301**

Jazz and the Process of Cultural Healing in the Republic of Panama and the United States

Travis Eales
Supervising Professor: ***Dr. Benjamin D. Koen***

The aim of this research is to investigate and analyze the transcultural effects of jazz music as it pertains to the socio-cultural relationship between the Republic of Panama and the United States, on personal, cultural, and diplomatic levels. I propose that jazz, a cornerstone of musical culture in Panama and the United States, acts as an agent for healing the near 100 years of political and subsequent social strife that exists between these two countries. I intend to demonstrate how large-scale international exchanges such as the Panama Jazz Festival and the everyday performance practices of working musicians in the Republic of Panama and the U.S. facilitate an understanding of these nation's shared cultural identities and values, thus negating their historical grievances and paving the way for increased dialogue and cooperation. Through ethnographic field research and musical analysis carried out in Panama City in 2008 and this summer, I attempt to decipher the role of jazz in Panamanian society and the effects it has on perceptions of the United States. Hopefully, these findings can be used to create a model for diplomatic, educational, and cultural outreach programs that can work to heal the cultural divides between these two nations.

7:20 pm / **Room 1302**

Ranking and Aggregate Query Processing for Large Scientific Data with Fuzzy Information

Justin DeBrabant
Supervising Professor: ***Feifei Li***

The prevalence of uncertain data in current scientific and consumer databases has led to an interest in the development of new probabilistic databases. Common areas where probabilistic databases are being applied include sensor networks, entity-resolution algorithms, and even consumer shopping sites. Because of the uncertain nature of the underlying data, any query results on that data will also be uncertain. Previous research has led to metrics to determine exactly how uncertain these results are, namely the PWS-quality metric, which is an entropy-based calculation. In this project, we have adopted the PWS-quality metric and have looked to both extend and improve it. Thus far this metric has only been applied to range and max queries, which is a small fraction of all possible queries. Our work is aimed at finding an efficient algorithm for computing the PWS-qualities for top-k queries as well. In addition, we are exploring the problem of data-cleaning with a restricted budget. In previous work, a dynamic programming or greedy algorithm was used to determine the optimal cleaning set. However, because the optimal set changes as tuples are cleaned, we have designed an incremental approach that redetermines the optimal cleaning set after a portion of the original tuples have been cleaned. This incremental algorithm will allow a more accurate "optimal set" to be determined and thus the cleaning budget will be used more efficiently.

7:20 pm /**Room 1303**

New Antibiotics: An Exploration Into Complementary Drugs

Conrad David Gleber

Supervising Professor: ***Dr. D. Tyler McQuade***

Bacteria are deft adversaries that swiftly find myriad ways to thwart antibiotics. The rapid rise in resistant microbes has prompted many experts to predict the possibility of a post- antibiotics era. Though notorious gram-positive bacteria like MRSA monopolize most of the headlines, scientific societies (the IDSA, among others) are robustly sounding the alarm that gram-negative bacteria are equally dangerous. Indeed, the pipeline for anti-gram-negative drug discovery is even thinner than the one for anti-gram-positives.

While reviewing potential sources for new antibiotics, Walsh emphasized the fertile ground that combination therapies represent in fighting drug-resistant bacteria. Models to guide combination therapy development are currently lacking, however. We strive to bridge this gap by creating simple heuristic models to enable the rapid identification of targets and molecules that, when combined, yield highly-active antibiotics.

Herein, we describe the first two drug combinations we have discovered through one of our fledgling models. In this iteration, we demonstrate that by combining chain-terminating nucleoside analogs (ctNAs) with drugs designed to thwart the bacteria's anti-ctNA mechanisms, we realize synergies between 1000-10000-fold.

7:45 pm /**Room 1301**

Nucleosynthesis of 26-Aluminum Throughout the Galaxy

Henry Jared Doster

Supervising Professor: ***Dr. Ingo Wiedenhoever***

This research studies the nucleosynthesis of the radioactive isotope ^{26}Al. Its goal is to verify and calculate the stellar reactions that involve ^{26}Al in its different forms. The purpose of this research is to provide theoretical information that will assist the physics department's Experimental Nuclear Physics

Group in their upcoming ^{26}Al experiments, which will be conducted at FSU's Superconducting Linear Accelerator Laboratory. The larger goal of the aluminum experiment is to better understand the nuclear reactions and processes that occur in supernova throughout our galaxy.

Specifically, this research investigates how ^{26}Al fits into core-collapse supernovae. Because ^{26}Al is easy to detect with satellites, it is a strong source of supernovae data. Consequently, to better understand the mechanics of supernovae, we must better understand 26Al. This means studying its creation, destruction, and processes of equilibration.

The research is divided into two parts. The first part deals with compiling previous experimental data pertaining to ^{26}Al and other nuclei associated with its nucleosynthesis, such as ^{27}Si and ^{27}Al. The second part deals with calculating theoretical data, pertaining to the same nuclei, that fills in the gaps of the experimental data.

Finally, astrophysical rate calculations reveal the nuclear reaction rates of ^{26}Al in both its ground state and metastable state. These rate-calculations will then be used to guide the upcoming ^{26}Al experiments.

7:45 pm / **Room 1302**

Wellness in Community: Exploring the Use of Creative Expression in Providing Ongoing Self-Care

Kaitlyn Suveg

Supervising Professor: ***Dr. Nicholas F. Mazza***

In the Social Work educational curriculum, there is an emphasis on the idea that helpers must ultimately receive help themselves in order to be effective practitioners operating at an optimum, healthy level. The most obvious resource for achieving this goal is through outside counseling; however, this is not always attainable. Those in helping professions welcome suggestions as to how professionals might maintain a healthy balance between their practice and personal lives. I believe that we all possess creative skills through which we are naturally able to cultivate personal wellness, exclusive of professional therapy, and that a special intersection exists between art and science, writing and social work, where self-care is fostered.

The study is grounded in an 8-week writing workshop conducted with the interns of a non-profit organization based in Cocoa, FL and serves as an exploratory method of examining the effectiveness of creative expression in self-care for helping professionals. This project was created after the recognized need for a source of self-exploration among helping professionals, and seeks to "help the helper" by exploring the creative skills already available to them, ultimately preventing what is known as "compassion fatigue" or "burnout" in the social work profession.

7:45 pm / **Room 1303**

The Effect of Gametes and Phytoplankton on the Spawning Response of the Echinoid Lytechinus Variegatus

Kim Reuter

Supervising Professor: ***Dr. Don Levitan***

Many marine invertebrates lack the ability to communicate with each other, making it difficult to find suitable reproductive partners. Many of these marine invertebrates often reproduce via mass spawning events, which involve releasing thousands of gametes simultaneously into the water column.

The cues triggering mass spawning events in marine invertebrates are not fully understood. External fertilizers are thought to be the primary cues by which spawning is synchronized to achieve fertilization. Using the sea urchin *Lytechinus variegatus*, we examined a variety of potential spawning cues for their effectiveness in eliciting a spawning response. In the laboratory, sea urchins were placed in isolation and exposed to phytoplankton and sperm cues. Spawning behavior and spawning times were recorded for males and females. Males spawned earlier in response to cues than females, and only males responded to the phytoplankton cue. These results suggest that phytoplankton may act as a primer, while sperm may be the final cue to induce spawning. Spawning in *L. variegatus* may involve a subset of males that respond to phytoplankton and release sperm thereby inducing a wider-scale spawning event.

8:10 pm / **Room 1301**

Single Cell Analysis of Osmosis

John Walsh

Supervising Professor: ***Dr. Samuel C. Grant***

Vital to the maintenance of cell homeostasis is a delicate balance of water and sodium in the intracellular and extracellular environment of every living cell. Osmosis, defined as the passive diffusion of water to regions of higher solute concentration, is driven by imbalances between cells and their environment which becomes critical in excitable cells such as neurons and myofibers. Using the L7 motor neuron from the sea slug *Apylsia Californica*, a known model organism for neuronal studies, the effect of osmosis on sodium distributions and cell swelling can be determined in this prototypical neuron. High field magnetic resonance imaging (MRI) using the 21.1 T, 900 MHz ultra-wide bore magnet at the National High Magnetic Field Laboratory (NHMFL) is performed to quantify intracellular sodium distributions. So far, the focus of this project has been on the construction of the solenoidal microcoil used in the MRI experiments and the perfusion chamber necessary to maintain control over the extracellular environment. The microcoil tuned to the resonant frequencies of both 1H and 23Na, 900 MHz and 268 MHz respectively, is used to perform MRI analysis on the isolated neurons. Through osmotic and toxic alterations of the extracellular environment, the effect of osmosis on intracellular sodium concentrations is measured.

8:10 pm / **Room 1302**

No correlation between periods of rise and dominance of simulated species

Alan Kuhnle

Supervising Professor: ***Dr. Per Rikvold***

L. H. Liow and others have observed a general feature of the occurrence trajectories (that is, the occurrence of a species plotted against time) of biological species: the periods of rise and fall of a typical species are about as long as the period of dominance.

Corroboration of this feature is sought in a pre-existing, individual-based model of biological evolution. This model was developed and studied by P. A. Rikvold and R. K. P. Zia. The population trajectories of individual species in the model are examined, but no analogous feature is observed in the simulated species populations. Instead, the periods of rise and fall of a simulated species cannot always be sensibly defined; when it does make sense to define these quantities, they are independent of the period of dominance.

Mentored Research and Creative Endeavors Awards
Poster Presentations

Daniel Flynn
Supervising Professor: Dr. Jennifer Jerit
How News Coverage Affects the Public's Knowledge About Congress

Javier Ramirez
Supervising Professor: Dr. Mark Kearley
Identification of Sites of Ethanol-Derived Protein Adducts Involved in Liver Damage

Jay Goddard
Supervising Professor: Dr. Yang Wang
Prehistoric Herbivores of Northern China

Kyle Mauk
Supervising Professor: Dr. Zuoxin Wang
The Neurobiology of Aggression: Vasopressin Signaling in the Prefrontal Cortex

Karen Ritter
Supervising Professor: Dr. David Gilbert
Positional Effects of Ptn on DNA Replication Timing and Transcription

Vincent LaBarbera
Supervising Professor: Dr. P.B. Chase
In vitro Troponin and HMM Interactions

Meghan Reina
Supervising Professor: Dr. Susan Wood
Improving the Quality of Social Studies Education in Elementary Schools

Lindsey Davis
Supervising Professor: Dr. Carlos Bolanos
Long-term neurobiological effects of chronic fluoxetine (Prozac) exposure during adolescence in female rats

Hanaah Frechette
Supervising Professor: Dr. Gerri Houlihan
Beyond the Canal: Exploring Panama's National Dances

William Pollock
Supervising Professor: Dr. Cherie Maestas
Voter Models and Risk Orientation

Gan Preamplume
Supervising Professor: Dr. Hong Li
Structure and Function of the CAS6 Protein-RNA Complex

Sarah Seip
Supervising Professor: Dr. Felicia Coleman
Effect of predator abundance and diversity on snail abundance, behavior, and impact in salt marsh

Crystal Betts-Green
Supervising Professor: Dr. Kathleen Erndl
Visions of Womanhood: Submission, Purity and Femininity in Modern Evangelical Movements

Gustavo Munoz
Supervising Professor: Dr. Ken Walsh
Resetting Semi-Passive Stiffness Damper

Andrew Rice
Supervising Professor: Dr. Igor Alabugin
Origin of Porphyrin Rings in Nature: Is the cycle of life fueled by stardust

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