URCAD 2011
Featured Presentation Abstracts

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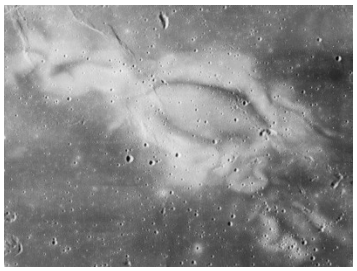
Lunar Swirls: How Dark are "Dark Lanes"?



Ecaterina Coman, B. Ray Hawke, Jeffrey J. Gillis-Davis
David T. Blewett, Johns Hopkins University Applied Physics Laboratory

Swirls are unusual sinuous bright markings found on the surface of the Moon. The swirls often contain "dark lanes" within the bright undulating sections. All swirls correlate with the presence of magnetized crustal rocks, but not all magnetic areas exhibit bright markings. The mechanism by which swirls form is a longstanding mystery. One hypothesis holds that a magnetic anomaly prevents solar wind protons from striking the surface and thus inhibits the normal weathering and darkening of the soil. If so, it is possible that the deflected protons will collide with the surface around the perimeter of the magnetic anomaly where the field is weaker. The resulting enhancement of ion bombardment could cause increased weathering, explaining the dark lanes. The goal of this study is to determine if the dark lanes have truly low reflectance, or instead just appear dark relative to the high-reflectance portions of the adjacent swirl. Image profiles across several lunar swirls have been analyzed to determine the relationship between the reflectance of dark lanes and that of background soil. We have identified locations where enhanced weathering may be taking place, suggesting that the solar-wind shielding hypothesis may be correct.

This work was funded by the NASA Planetary Geology and Geophysics Program.
(Top)

An Analysis of the Peace-building Strategies in Ker Kwaro Acholi's Strategic Plan 2009-2014

Achsah Joseph
Devin Hagerty, Professor, Department of Political Science

After decades of war, Northern Uganda has achieved relative peace. Although many national and international organizations have developed peace-building plans, the only plan created by the Acholi chiefs was Ker Kwaro Acholi's Strategic Plan. This study sought to examine: (1) how the objectives in the Strategic Plan relate to peace-building, (2) if Ker Kwaro Acholi has the resources to fulfill the plan, (3) how it is viewed by Gulu citizens, and (4) the effectiveness of the completed programs. This study was conducted in Gulu, Northern Uganda, and included one focus group and six one-on-one interviews. The interviews were conducted with Gulu citizens, Acholi chiefs, and Ker Kwaro Acholi employees. Dependence on outside funding, low staff retention rates, and inadequate equipment make it unlikely that the Strategic Plan will be completed within the 2009-2014 time frame. However, the organization has well trained staff, which makes the implementation of the plan feasible. Interviews with Gulu citizens informed me of the plans' trustworthiness. Ker Kwaro Acholi employees, chiefs and project reports discussed the programs' effectiveness. I found that the Strategic Plan's success is based on traditional Acholi culture. However, modifications need to be made in order to address the needs of the younger Acholi population.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.
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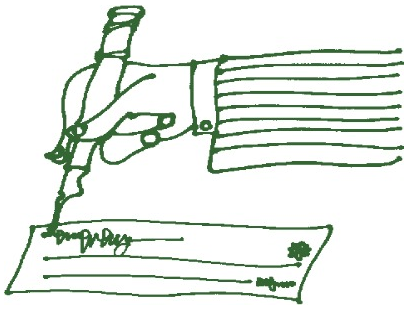
Worthwhile or Wasteful? An Evaluation of Techniques for Measuring the Impact of Business Subsidies



Andrea Thomson
Roy T. Meyers, Professor, Department of Political Science

This research investigates (1) Maryland, Pennsylvania, and Virginia's methods of gathering information about the performance of their economic development programs and (2) the use of this information in policy formation and decision making. Most states employ an assortment of development programs to grow local economies. These incentives include: business tax preferences, grants and loans. Unfortunately, actual incentive impacts are elusive, hindering state agencies' ability to distinguish between worthwhile and wasteful business subsidies. The product of this research is a set of practical recommendations aimed at addressing this information shortfall while guiding states in the formulation of more effective economic policies. The information in this presentation was gathered though interviews and a review of primary and secondary sources.

This work was funded in part by an Undergraduate Research Award from the UMBC Office of Undergraduate Education.
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Nigeria's Resource Curse - Conflict in the Niger Delta

Amond Uwadineke
Carolyn Forestiere, Associate Professor, Department of Political Science

The goal of this research was to gain a better understanding how the presence of oil in the Niger Delta has influenced conflict within this important region in Nigeria, and how this natural resource has hindered the development of the political institutions of the Nigerian State. Three important themes were addressed in this research: 1) the "resource curse" in Nigeria, 2) ethnic identity in the Niger Delta, and 3) the different types of conflicts found within the Niger Delta. The Niger Delta region produces enormous oil wealth for the Nigerian state, but there is a paradox, in which the people of the Niger Delta have not benefited from the vast oil wealth. Now after many years of neglect, many of the ethnic groups that inhabit this region have been making their voices heard with both peaceful protest, and armed resistance in support of their demand for a greater share of Nigeria's oil revenue. The research questions were answered using data from local reports by non-governmental institutions, parastatals, multinational companies, and books on the Niger Delta. Finally, the importance of this research is that it sheds light on a struggle within a nation that is the United States fifth largest source of imported oil.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.
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Feasibility of Wind Predictions off the East Coast for Wind Energy Turbines

Eliana NessAiver, Soutry De
Lynn Sparling, Associate Professor, Department of Physics

It is becoming widely recognized that traditional forms of energy such as fossil fuels are not sustainable and have gradually lead to significant climate change. As a result, research into

alternative sources of energy has become an increasingly important endeavor. Currently, the scientific community does not have much detailed knowledge about winds near the mid-Atlantic coast, a necessity for establishing the feasibility of building wind turbines in coastal or offshore regions. Business investments in particular depend upon whether available weather data are sufficient to determine wind patterns in a specific area. Such data often spans only a short length of time, necessitating accurate extrapolation from these short-term measurements to long-term patterns. This study addressed the collection and analysis of wind data to determine predictability and strength of mid-Atlantic winds and to identify inter-annual, seasonal and diurnal patterns in wind speed and direction using wind measurements gathered from multiple sources. These sources included buoys, weather balloons, and anemometers on high towers from a number of locations along the coast. Our results indicated that the mid-Atlantic winds offer a promising wind resource for mega-watt wind turbines.

This work was funded, in part, by the UMBC Physics Department and through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.
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Adolescent Mothers In a Quilombo Community: Praia Grande, Brazil

Christina Briscoe, Climene Camargo, Jovânia Marques de Oliveira e Silva, Damiana de Miranda
Bambi Chapin, Assistant Professor, Department of Anthropology

This exploratory, ethnographic study addressed the characteristics and meanings of adolescent motherhood in Praia Grande in Bahia, Brazil. Praia Grande is a *quilombo*, or community descended from escaped slaves in an isolated location. The participants were the twenty women of the 161 Praia Grande women between the ages of twelve to twenty who had at least one child (11 percent). Results derived from participant observation, *Programa da Saúde da Família* (Family Health Program) documents, surveys, a life history and interviews. During this research, lack of employment opportunities, importance of the family support, and confusion about birth control emerged as central themes. In addition, infrastructural inadequacies, from lack of public sanitation or police to timely medical care to the practical inaccessibility of education, were commonly mentioned by these young women as impediments to achieving desires for themselves and their children, pointing to the structural violence experienced in the *quilombo* population. The study highlights the need to assess cultural contexts of adolescent motherhood before implementing public policies for *quilombo* reproductive health programs.

This study was funded through the UMBC Office of Financial Aid and Scholarships in transfer of the Premier Scholarship to conduct abroad research.
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Music for All: Provate Music Instruction in Carroll County, Maryland

Meredith Donaho
Joseph Morin, Lecturer, Department of Music

In Carroll County, Maryland, music is traditionally underfunded within the public school curriculum and as a county-sponsored after-school activity; the recent economic downturn has only increased this situation. In addition, many students lack the finances and access to private music instruction needed to reach their fullest potential and achieve life-long enrichment. To determine the need for private music education in Carroll County, Maryland, research was structured in two main phases. In the first phase, a needs-based assessment was completed with data derived

through a questionnaire administered at Head Start parent policy meetings and parent-teacher meetings at elementary and middle schools across Carroll County. The data indicated a need for an after-school music education program. The second phase included the creation of a two-week volunteer pilot program that took place in March in the towns of Westminster and Union Bridge where children, who lacked the opportunity to engage in learning an instrument, from kindergarten through middle school, could receive beginning private lessons on guitar, piano, and percussion. This pilot program verified the initial data derived from the questionnaire. In addition, various existing local non-profits were studied to gain insights into how to transition the volunteer pilot program into a non-profit.

This work was funded through the Undergraduate Research Award from the UMBC Office of Undergraduate Education.
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Modelling Sensory Input to the Lamprey Spinal Cord

Geoffrey Clapp
Kathleen A. Hoffman, Associate Professor, Department of Mathematics and Statistics

Sensory input has a profound effect on vertebrate locomotion but is not well understood. The lamprey is a model system for studying vertebrate locomotion because its spinal cord contains the same types of neurons as its human counterpart, except in smaller quantities. Biological experiments have revealed that the lamprey's swimming motion is modulated by input to the spinal cord from edge cells, sensory organs that measure the body's curvature. In order to better understand the role of edge cells, we develop and evaluate two types of mathematical models of the lamprey's central pattern generator of locomotion, implemented as a chain of coupled oscillators. Starting with a neural model that represents individual classes of neurons within each oscillator, we use phase reduction techniques to derive a first order phase model that represents each oscillator by a single variable. This derivation will allow for a direct comparison of neural model and phase model results. A comparison of these models will provide insight into the appropriate level of biological detail needed to study edge cell input.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.
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Measles in a Modern World: Comparing the 2008 Outbreaks in Austria and the United States

Julianna M. Kuhn
Dawn Biehler, Assistant Professor, Department of Geography

In developed countries, like Austria and the United States, measles is often regarded as a disease of the past. However, in 2008 measles outbreaks occurred in both countries affecting several hundred individuals, securing measles a place as a modern-day problem. This research examines each country's outbreak by first evaluating the mechanics of the disease spread. The second portion asks for a more complex analysis of the episode: How have the media and popular discourse represented a) the measles outbreaks, b) the people who were infected, and c) the responsibility of the individuals and the state for controlling disease? The answers to these questions were sought through a qualitative discourse analysis of Austrian and American popular media documents, government reports and supplemental interviews. Each culture is navigating infectious disease in a global community where matters of personal freedom versus public safety are intensified by the fast-paced exchange of germs. Perceptions of parental versus government responsibility and the validity of the

choices made by each show more individualistic trends in the United States compared to Austria. Despite these differences on the macro level, a government official, parent or doctor in Austria often experiences the same conflicts as their counterpart in the United States opening the possibility for an exchange of methods and logic.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.
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Moving to Water

Emily Kimak
Carol Hess, Professor, Department of Dance

A deeper understanding of the interrelationship between humans and nature has grown from scientists and artists alike. Moving to Water attempts to heighten awareness of this relationship through the lens of dance by revealing what lies between the human body and water in modern western culture. This project uses the perspective that awareness of water use can be acquired through increased consciousness of bodily actions used to access water on a daily basis. I expanded my knowledge of body awareness and ecology at the conference Somatic Experiments in Earth, Dance and Science, curated by Olive Bieringa of Body Cartography, in workshops on Body-Mind Centering, improvisation, and ecology. Additionally, I completed a literature review of performance and visual art centered on environmental topics. This research culminates in my original choreography of the dance piece Moving to Water, which explores movement including twisting of knobs, washing, and drinking. These seemingly mundane movements contribute significantly to our consumption of water and provide a wealth of possibility for dance composition. The piece was composed using improvisation, phrase work, a visual score, and the concept that all actions can be considered performance. The performance takes place in a public space on UMBC's campus, using the familiar landscape as sound and set.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.
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Nostalgia for Everything

Theresa Columbus
Preminda S. Jacob, Associate Professor, Department of Visual Arts

Last summer, I traveled to Greece to make a video about memory, longing, cross-cultural communication and the emotions involved in making or interpreting a piece of art. In viewing this piece, the audience becomes the disoriented traveler and witness to the introspective musings of the artist. The montage of performance, absurd dialogue and my personal depiction of the creative process continually shift the audience's perspective, creating a richness of sensation along with the perplexity travelers often experience. The disjunction between lines of dialogue and the intimate proximity to actors' faces evokes an odd yet familiar experience for the audience. Humor is used to translate some of the disjointed communication into something that feels natural. Viewing the Cretan countryside becomes a metaphor for the instinctual process of creativity itself, in contrast to the self-consciousness and struggles that are discussed.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.
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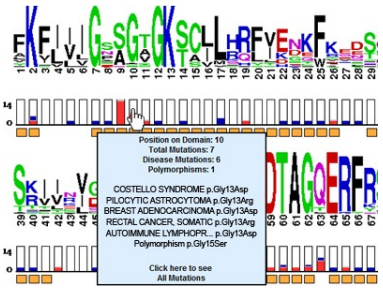
DMDM: Domain Mapping of Disease Mutations



Thomas A. Peterson, Nathan Nehrt, Asa Adadey
Maricel G. Kann, Assistant Professor, Department of Biological Sciences

Domain mapping of disease mutations (DMDM) is a database in which each disease mutation can be displayed by its gene, protein or domain location. DMDM provides a unique domain-level view where all human coding mutations are mapped on the protein domain. To build DMDM, we aligned all human proteins to a database of conserved protein domains using a Hidden Markov Model-based sequence alignment tool (HMMer). We used the resulting protein-domain alignments to provide a domain location for all available human disease mutations and polymorphisms. The number of disease mutations and polymorphisms in each domain position are displayed alongside other relevant functional information (e.g., the binding and catalytic activity of the site and the conservation of that domain location). DMDM's protein domain view highlights molecular relationships among mutations from different diseases that might not be clearly observed with traditional gene-centric visualization tools. These unique graphical interfaces can provide new insight into proteins related by their domains and disease mutations, revealing commonalities between diseases.

This work was funded, in part, by National Institutes of Health (NIH) grants 1K22CA143148 to M.G.K. (PI) and R01LM009722 to M.G.K. (collaborator).

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The Role of Economic Disparity in Human Rights Abuses: Case Study on Rwanda and Sierra Leone

Daniet Moges
Cynthia Hody, Associate Professor, Department of Political Science

Approximately one million people have died in the Rwanda and Sierra Leone genocides. Mass killing and genocide have been a too common phenomenon in sub-Saharan African countries. The social tension that erupts into such horrific human rights abuses has been mostly classified as the result of ethnic diversity or flawed government, or both. This research develops case studies of Rwanda and Sierra Leone in order to illustrate how another factor, economic disparity can lead to human rights abuses. This study addresses the role of economic disparity in the existence of human rights abuses in Rwanda and Sierra Leone despite the absence of such abuses in other states with similar economic disparity.

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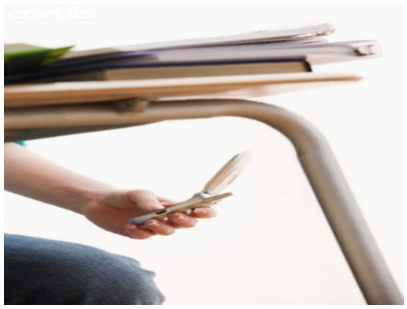
Limiting the Distractions of Cell-Phone Use in the Classroom



Christian F. Solliday
Linda Oliva, Assistant Professor, Department of Education

Despite the fact that there is a school-wide policy against having cell phones in the school building, students' use of cell phones during instruction is pervasive. Students' cell phone use was distracting them from their work and included sending and receiving text messages, sending and receiving emails, talking, listening to music, and surfing the Internet. This study investigated the effect of positive behavioral interventions on student cell-phone use in two high school social studies classes. Students were rewarded for keeping their cell phones out of sight at all times during class. Students who did use their phones caused the entire class to be excluded from the

reward of receiving candy. The successful completion of eight consecutive weeks would result in a pizza party for the class. After four weeks without success students were then given rewards on an individual basis every five days, since most violations were continually committed by the same students. Eight students (four who received rewards and four who did not) were interviewed to explore the reasoning behind the use of cell phones and the effect of various reinforcements.
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Americanized Pedagogy: Journey to El Salvador

Casey L. Gray
Jean Fernandez, Associate Professor, Department of English
Lucille McCarthy, Professor, Department of English

The experience of North American teachers abroad is an understudied aspect in contemporary research on English as a Foreign Language. To concretely internalize Popular Education pedagogies and how or why they may be incorporated in the United States, I became a volunteer teacher of English and student of Spanish at the The Melida Anaya Montes Language School of the Centro de Intercambio y Solidaridad. This study analyzes in a report of teacher research the present day applications of Popular Education pedagogies in El Salvador. It also addresses how these pedagogies under the influence of globalization and North American educators can in fact limit rather than promote education as a practice of freedom. Drawing on the philosophies of theorists John Dewey and Paulo Freire, I conducted a case study which explores the effects of capitalistic ideologies on both teachers and students. Through ideologies of consumerism, the projection of absolute ignorance and deficit thinking, this study uncovers how the classroom can become a center for oppressive relationships and subordination.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.
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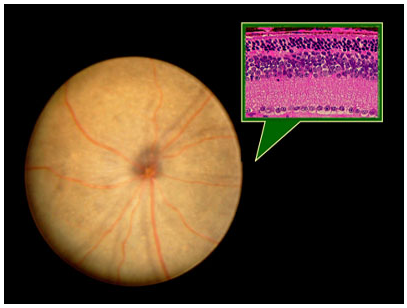
Genetic Pathways Involved in Retinal Degeneration



Rima Kikani, Anastasia Krasnoperova*, Rivka Rachel*, Anand Swaroop*
**Neurobiology-Neurodegeneration and Repair Lab, National Eye Institute, National Institutes of Health*
Sally Shivnan, Senior Lecturer, Department of English
Rivka Rachel, Senior Staff Scientist, National Institutes of Health

Retinal degeneration affects over 1.5 million people each year worldwide. Although we have mapped the genetic causes of the condition, the underlying cellular mechanisms behind photoreceptor cell death are not well understood. Homologous genes that trigger retinal degeneration have been identified in mice, allowing us to examine the biological changes that occur in a non-human species. We studied and grouped all the mutants according to rate and severity of photoreceptor function loss. This project analyzed tissue loss through cell morphology and histology, localization of phototransduction proteins by immunohistochemistry, and altered photoreceptor function by electroretinography. Our results indicate that mutants associated with rapid degeneration (rd1, rd4, rd10, rd16) control phototransduction and ciliogenesis. They generate missense mutations without terminating DNA translation and are linked to autosomal dominant retinitis pigmentosa in humans. On the contrary, mutants tied to intermediate (rd2, rd3, rd5, rd8) and slow (rd6, rd7, rd9, rd12) degeneration monitor general cell growth and development. They create base-pair deletions and substitutions that do cause premature termination of the polypeptide chain and result in autosomal recessive retinitis pigmentosa in humans. The goal is to identify mechanisms that we can apply to treat human retinal degeneration.

This research was funded by the Intramural Research and Training Award Fellowship program at the National Institutes of Health.
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TweetCollector: a Framework for Retrieving, Processing, and Storing Live Data from Twitter

Ross A. Pokorny
Timothy W. Finin, Professor, Department of Computer Science and Electrical Engineering
Anupam K. Joshi, Professor, Department of Computer Science and Electrical Engineering

Social media systems like Twitter and Facebook provide an important new source of information about emerging events, interests, opinions, and trends. While these posts are brief, they are rich in meta data and connected to complex social networks. Twitter is an especially interesting source due to its openness and high volume of over 100 million posts a day. Collecting, filtering, analyzing and storing information from a dynamic Twitter stream is an essential component for any system that derives information from it. I designed and implemented TweetCollector as a scalable system to automatically collect Twitter status updates matching a user-specified query. The received tweets are run through an extensible workflow, to which new components can be added as needed. After processing, the status updates, along with the data generated during the processing phase, are stored in a relational database for human inspection and further analysis. Scalability is achieved in a multicore environment through the use of multi-threading and resource pooling. TweetCollector ensures reliable collection of statuses with on-the-fly processing in order to allow social media researchers to rapidly discover and react to new information from a promising new data source.

This work was funded, in part, by the Office of Naval Research through a subcontract from Lockheed Martin.
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Annotation of Highly Up-/Down-regulated *Aedes aegypti* Genes and Investigation of their Anti-Dengue Activity

Christelle K. Samen, Shuzhen Sim, George Dimopoulos
George Dimopoulos, Associate Professor, W. Harry Feinstone Department of Molecular Microbiology and Immunology, Johns Hopkins Bloomberg School of Public Health

As many as 100 million cases of dengue infection occur annually. The continued challenges in vaccine development and mosquito eradication efforts show an urgent need to find new methods of control. The RNA virus is transmitted between human hosts by mosquitoes, primarily *Aedes aegypti*, as a blood meal is taken. Many *Aedes aegypti* genes that code for proteins of unknown function are currently not annotated. In this work, we used BLAST to search for homologues in other organisms of the most highly up-/down- regulated genes from several *Aedes aegypti* microarrays comparing gene expression in various mosquito body compartments. This annotation will aid in achieving the following aims: first, to learn which genes are specifically expressed in each compartment, and which genes are ubiquitously expressed throughout the mosquito; and second, to assess the effect of dengue virus (DENV) infection on gene expression. Our preliminary results show that many of these unannotated genes do not seem to be transcriptionally regulated during DENV infection, but these findings do not rule out their importance. Further analysis and a better understanding of genetic function could lead to the identification of novel strategies of dengue control.

*This work was funded, in part, by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC.*
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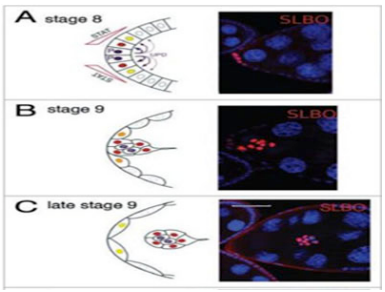
Building a Mathematical Model to Understand the Molecular Interpretations of Spatial Gradients of Biological Activators



David P. Stonko, Xuan Ge
Bradford E. Peercy, Assistant Professor, Department of Mathematics and Statistics
Michelle Starz-Gaiano, Assistant Professor, Department of Biological Sciences

Small alterations in biochemical signaling can be transformed into major differences in cellular decisions. Our interdisciplinary project revolved around the conserved Signal Transduction and Activator of Transcription (STAT) signaling pathway and the regulation of cell decisions. The STAT pathway is essential in stem cells, immune function, and some cancer progression. We took advantage of a simple system in Drosophila ovaries to identify the mechanism that determines STAT activation and results in the transition of stationary cells to migratory ones. STAT activation is initiated by diffusible molecules radiating from a localized source, generating graded activation in neighboring cells. Cells closest to the source robustly activate downstream signaling, and become mobile cells; distant cells downregulate signaling and are stationary. A heuristic model of the molecular interactions can capture how graded signal is converted to activation of motile cells. We analyzed this model to determine the critical parameters and determined its underlying mathematical structure and relationship to the biology. We began to construct a biophysical model to inform new testable hypotheses. We will continue to polish this biophysical model and conduct genetic and cell biological experiments to understand how epithelial cells can convert analog information into the binary activation of a molecular pathway.

This work was funded by a grant from the National Science Foundation for the UBM Undergraduates in Biological and Mathematical Sciences program.
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Effectiveness of Spin-on-Glass Films on Reducing Dielectric Breakdown in Poled Polymer Devices

David A. Sweigart
L. Michael Hayden, Professor, Department of Physics

We investigated the effect of Spin-on-Glass (SOG) layers as charge barriers which help to prevent dielectric breakdown in sandwiches of electro-optic (EO) polymers during high-field electric poling. Thin film samples of EO polymers were prepared consisting of mixtures of guest chromophores embedded within a polymer host. Application of an electric field, at a temperature above the polymer's glass transition temperature, results in a partial alignment of the guest chromophores. Higher poling fields give rise to better chromophore order which is directly related to the macroscopic optical nonlinearity. The poling efficiency is severely limited by the onset of dielectric breakdown. The poling field where breakdown occurred could be increased by insulating the polymer film with sub-micron thick SOG barrier layers, leading to enhanced poling field strengths and larger EO coefficients. These results show that our poling technique using SOG layers may be a promising method to create improved EO polymer devices for a broad range of applications including EO modulators and THz emitters and sensors.

This work was funded, in part, by a grant from the National Science Foundation No. DMR 0120967 and through the Undergraduate Research Assistantship Support program from the UMBC Office of the Vice President for Research.
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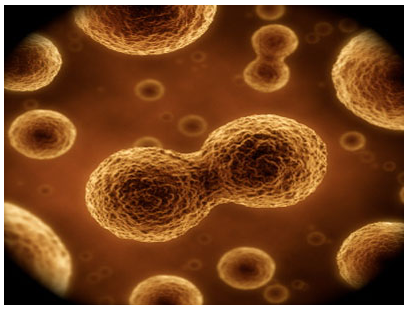
Characteristics of Kynurenine Pathway Metabolites and Enzymes in Human Blood Cells



Margarita A. Tararina, Ana Pocivavsek, Robert Schwarcz
Ana Pocivavsek, Postdoctoral Fellow, Maryland Psychiatric Research Center, Department of Psychiatry, University of Maryland School of Medicine
Robert Schwarcz, Professor, Maryland Psychiatric Research Center, Department of Psychiatry, University of Maryland School of Medicine

Studies in human tissues and body fluids, as well as animal models, implicate the pathophysiology of several immune and central nervous system diseases, including schizophrenia and Huntington's disease, in the impaired function of the kynurenine pathway (KP) of tryptophan degradation. However, only sporadic attempts have been made to examine peripheral KP metabolism in easily-accessible blood cells in humans and to use these measures as indicators of abnormal KP function in the brain. The present study was designed to develop new methodology to investigate the activity of several KP enzymes in peripheral blood mononuclear cells (PBMCs) obtained from healthy volunteers (N = 4). Blood was drawn by venipuncture, transferred into histopaque tubes, and immediately centrifuged (1000 x g, 10 min). The buffy coat was removed, washed with saline, and re-centrifuged to obtain the PBMC pellets, which were used to identify and characterize kynurenine 3-monooxygenase, kynureninase, and 3-hydroxyanthranilic acid dioxygenase activities. Many properties of these enzymes in PBMCs proved to be very similar to the brain. Thus, analysis of the KP pathway in PBMCs may provide a convenient means to monitor KP metabolism in the brain, allowing the study of this pathway under both physiological and pathological conditions.

This research was funded by NIH/NINDS Grant # RO1NS057715 to Robert Schwarcz.
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Crotamine, the Protein from the Venom of the South American Rattlesnake, and its Binding to DNA

Maria D. Vitery, Richard Karpel
Richard Karpel, Professor, Department of Chemistry

Crotamine is a protein from the venom of the South American rattlesnake (Crotalus durissus terrificus). This 42-residue polypeptide is a nucleic acid binding protein that is capable of penetrating cells and targeting chromosomes. It has the ability to carry plasmid DNA into cells that are actively proliferating. Cell penetration is believed to follow interaction of crotamine with cell surface heparan sulfate proteoglycans. This quality makes crotamine a potential candidate for drug transport. The goal in the lab is to quantify salt dependence, binding site size and affinities of crotamine for DNA. Our experiments focus on studying the binding of crotamine to single- and double-stranded DNA over different ionic conditions. In these experiments, the fluorimeter is used to determine light scattering, which is a measure of particle size. In parallel, we perform experiments that include the usage of a DNA-intercalating dye, ethidium bromide. Ethidium bromide intercalates within DNA and absorbs light at 600nm, and becomes fluorescent when bound to DNA. In these experiments, the interruption of DNA and ethidium bromide fluorescence by crotamine and its reversal by heparin is being quantified.

This work was funded, in part, by the UMBC Designated Research Initiative Fund (DRIF).
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The Past That is Always Present: The Role of Memoir in Identity

Salma M. Warshanna
Robin Farabaugh, Senior Lecturer, Department of English

Memoir writing is the gold rush of the twenty-first century. While memoir is certainly a mode of self-expression, it is largely crafted for the reader's understanding. My analytical essay focuses on how the combination of the first-person perspective and a rich description of memories allows memoir to connect to a reader's sense of self in ways that no other genre can. A quiet dialogue occurs, where the reader is invited to live moments of another life and, more importantly, understand how the past is always present in identity. My research includes an annotated bibliography of a handful of memoirs. For the creative component of the project, I traveled to Egypt, where my parents grew up and the majority of my relatives still reside. Based on my experiences, I wrote a series of creative nonfiction essays that explore my parents' emigration from Egypt, my relationship with each of them, and how being raised between two cultures has shaped my identity. My semester abroad in the United Kingdom played a crucial role in how I understand my parents and their immigrant experiences, and those explorations are woven into the overarching story of identity.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.
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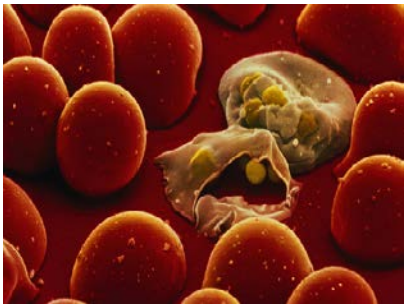
The Effects of Risk Aversion on Portfolio Asset Allocation

William D. Hanchett
Douglas J. Lamdin, Professor, Department of Economics

Standard advice for retirement investment portfolios makes use of a glide path by which the portfolio holds less in stock and more in bonds over time. This implicitly assumes a rising level of risk aversion of investors as they approach retirement. This study examined how those percentages are calculated and more specifically, what those percentages imply about both the level and path of investors' risk aversion. Through utility analysis and simulation methods, this study has shown that a one-size-fits-all glide path cannot be the optimum for all investors when their risk aversion varies. A wider variety of investment strategies would benefit investors. For example, rather than a single path for all investors, aggressive, moderate, and conservative strategies can be used. With a more individually tailored portfolio, an investor can use a more appropriate investment strategy. Implementing more congruous strategies, however, requires improved assessments of investors' risk aversion, so ways to do this were also examined.
(Top)

The Presentation of Plasmodium Antigen by Splenic Dendritic Cells



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Malaria is caused by a protozoan parasite from the genus Plasmodium, which is transmitted to humans through the bite of a female Anopheles mosquito. Previous research in our laboratory has shown that CD8+ T cells are essential for protective immune response against malaria. Dendritic

cells (DCs) are required to present antigen to CD8+ T cells. A thorough understanding of DC-CD8+ T-cell interactions is critical for the development of a successful vaccine. The primary objective of our research was to determine whether or not DCs present Plasmodium antigen to CD8+ T cells. To address this question we immunized C57BL/6 mice intravenously with 100,000 sporozoites per mouse. Splenic DCs were purified from the animals 48 hours post-immunization and incubated with carboxylfluorescein succinimidyl ester (CFSE) labeled CD8+ T cells. CFSE dilution was used as a marker for CD8+ T-cell proliferation. In our experiments, 20.1percent of CD8+ T cells proliferated when incubated with sporozoite activated DCs. Based on these results, we conclude that Plasmodium berghei CS5M sporozoite activated DCs can prime CD8+ T cells. An understanding of how a protective immune response against malaria is generated will provide insight into the development of a malaria vaccine.

This work was funded by Johns Hopkins Malaria Research Institute Summer Undergraduate Program.
(Top)

Mitochondrial Gene Shows Recent Diversification of the Yellow-backed Oriole

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The yellow-backed oriole, Icterus chrysater, is a tropical oriole that inhabits much of Central America. It has two disjunct populations, one from Mexico to Nicaragua and the other one from Panama to Colombia. Moreover, there is a 660 km gap in its distribution in Costa Rica. Based on its extensive range, four different subspecies have been described, even though they only differ in minor plumage coloration. This research consisted of sequencing the mitochondrial DNA control region from several Yellow-backed Orioles throughout its range. These molecular results were used to examine the genetic variation within the species, and to determine whether this differentiation is related to geography. Analyses of the mitochondrial DNA data "haplotype network" did not show substantial evidence of differentiation. Indeed, there are no fixed differences separating the north and south populations. Even though there is a major split in the geography range of this group, molecular data suggest this complex should still be considered one species. In birds and other organisms, a combination of molecular, morphological and behavioral data will give us the information needed to understand tropical biodiversity.

This work was funded, in part, by the Undergraduate Research Assistant Support Program from the Office of the Vice President for Research and by the National Science Foundation.
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The Effect of Transgenic Manipulation of the BK Channel (Kcnma1) on Circadian Rhythmicity in Mice

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BK Ca2+ and voltage-activated K+ channels expressed in the suprachiasmatic nucleus (SCN), the brain's master clock, regulate circadian rhythmicity. Loss of the BK channel gene (Kcnma1-/-, BK KO) disrupts the expression of circadian time, mediated by the daily patterning of action potentials in the SCN. To further understand how the BK channel controls circadian behavioral activity, we analyzed the effect of a transgene containing a gain-of-function point mutation in the voltage-sensor of

the channel (Per1:R207Q). We hypothesized that alteration of the BK current in the SCN by expression of one or two copies (1C, 2C) of Per1:R207Q on a wild-type background or one copy of Per1:R207Q with one deleted endogenous copy of Kcnma1 (1C; BK het) would disrupt circadian wheel-running behavior. In contrast, 1C, 2C, and 1C; BK het mice had relatively normal circadian rhythms. However, compared to WT, adding one copy of Per1:R207Q altered the robustness of the circadian rhythm and caused a longer active interval. The disruption of distinct circadian parameters by expression of Per1:R207Q suggests that BK channels are important for generating normal circadian rhythmicity. Understanding the neural encoding of circadian rhythms may impact the treatment of sleep and other disorders of circadian rhythmicity.

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