

URCAD 2012

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Backspace/Erase: Delete

Ryan K. Cox

Fred Worden, Associate Professor, Department of Visual Art

Backspace/Erase: DELETE is an experiment in creating a video adaptation of an original comic book story. Delete was completed using a computer drawing tablet and three computer software programs: Adobe Photoshop, Adobe After Effects and Adobe Flash. The flexibility and efficiency of using computer software allowed for a more manageable and less time-consuming workflow than with traditional cel animation. This was especially important as, unlike with a Hollywood production, I was the sole animator available to put in the time necessary to achieve the sophisticated graphic and dynamic style I hoped to achieve. I had to find a balance between the visual subtleties of the hand drawn animation technique and the time saving properties of computer frame interpolation animation. One of the creative challenges of Backspace/Erase: DELETE was deciding how to incorporate and adapt the strongest features of the print media, multi-panel comic book version of the story into a smoothly flowing time-based animated film. This required both careful pre-production planning, including using story boards to plan a scene's composition, as well as some trial and error modifications of those plans as I undertook the actual animating.

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Spiritual Music and its Relation to Personality

Cristóbal Fernández

Diane L. Alonso, Senior Lecturer, Department of Psychology

For some time, researchers have been interested in studying the relationship between spirituality and personality traits. Studies have shown that transcendental meditation, a type of spiritual meditation, has yielded positive results in reducing migraine-related problems in individuals who are classified as being “opened to experience,” by the “Big Five” personality traits scale.

The current study investigates whether spiritual music can help reduce anxiety for individuals who are “opened to experience.” Sixty participants are randomly assigned to one of three groups. An initial blood-pressure reading is taken for all three groups. Then all participants complete a simple task but are given falsified results, showing poor performance, in order to create anxiety. Next, a second blood-pressure measurement is taken, after which participants are asked to wait. Depending on their group assignment, they will hear in the background either Gregorian chants, Pop music, or no music at all. After five minutes, a final blood-pressure reading is obtained in order to be compared to the previous two readings. It is expected in this study that participants who listen to Gregorian chants show a faster return to their original blood pressure levels indicating that spiritual music may be helpful in reducing anxiety.

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Anagram

Brianna K. Helmlinger

Doug Hamby, Professor, Department of Dance

My goal for the creation of Anagram, a dance performance work, was to explore the visual aspects of a painting (by Stephanie Seker) through modern



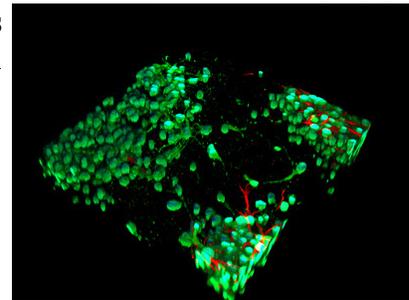
dance choreography. Through my choreographic process I explored the dynamics, spacing, colors and textures of the painting and also created dance phrases out of words that appeared on the painting. To illustrate emotions that I saw in the painting I created explosive and contrastingly smooth movement through the use of ripples, repetition and dancers moving in unison. I also collaborated with the dancers to help create new and interesting movement and spacial patterns. Instead of making it obvious to the viewer that my dance was based on a painting, I began by first selecting the costumes. Then I asked the painter to create a painting based on the color and texture of the costumes. In this way, the dance remained abstract and each viewer could discover the dance in her or his own way. ***This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.***

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Signaling Response of Neuronal Cells to 3D Tissue Scaffolds

Dalton N. Hughes, Andreia Ribeiro, Swarnalatha Balasubramanian
Jennie B. Leach, Associate Professor, Department of Chemical Engineering

Neurons grow and develop in the three-dimensional (3D) environment of the developing embryo. Previous work from our group has demonstrated that culturing embryonic neurons in 3D matrices allows the cells to respond in a way that more closely resembles natural development than traditional two-dimensional (2D) culture. Cells interact with their extracellular matrix and sense the dimensionality of their surroundings via integrin receptors on the cell surface that bind to matrix molecules, initiate intracellular signaling cascades and affect changes in cell shape and function. Our work focuses on elucidating the signaling events that regulate these changes in cell response. We hypothesize that 3D environments impose changes in matrix-ligand organization and alter neuronal behavior by modulating β 1-integrin cytoskeleton signaling. PC12 cells, a neuronal cell model, were cultured on 2D and within 3D collagen substrates and probe the signaling response by inhibiting several key signaling molecules involved in regulating neuron morphology: β 1-integrin, Focal Adhesion Kinase (FAK), and an activated form of FAK that is phosphorylated at tyrosine 397. The results of this study will identify the key signaling mechanisms in 3D neuronal culture and provide a biological basis for testing new biomaterial-based therapeutics.



This research was supported in part by a grant to UMBC from the Howard Hughes Medical Institute through the Precollege and Undergraduate Science Education, an Undergraduate Research award from the UMBC Office of Undergraduate Education, NIH-NINDS R01NS065205 (JBL), the Henry-Luce Foundation (JBL), and Wyeth Fellowship at UMBC (AR).

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Gender and Genre in Contemporary Chick-lit Novel

Eva Jannotta

Jessica Berman, Associate Professor, Department of English

Contemporary popular fiction novels written by and for women, often called “chick-lit” novels, are a genre frequently derided by the media and literary critics. Yet their commercial success and popularity attest to their importance and relevance to contemporary women readers. My research examines chick-lit novels from a Gender and Women's Studies and literary criticism perspective. I first analyze nine novels for the ways in which they imagine and represent contemporary white



professional women, paying particular attention to portrayals of female relationships, feminism, careers, and the perpetuation of whiteness as an invisible racial category. I then analyze three chick-lit novels in-depth, exploring them as contemporary revisions of fairy tales. Using folktale and postfeminist theory I explore how chick-lit novels masquerade as verisimilitude and disguise their elements of fantasy, thereby attempting to persuade the reader to believe in the fairy tale and feel reassured by it. My research illuminates the hopes and anxieties of contemporary white professional women as portrayed through the novels they read and write. Understanding the dynamics reflected in chick-lit novels and the fairy tale tropes these novels deploy allows readers and critics to understand the function, appeal and insight of chick-lit novels despite their dubious reputation.

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

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Visualizations for Self-Analysis of Performance for Older Adults

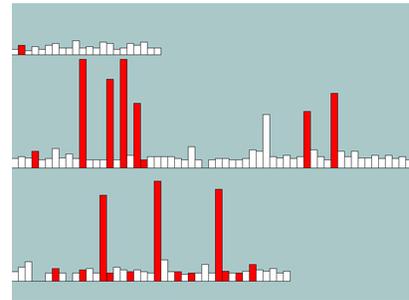
Jasmine Jones, Chitra Gadwal, Steven Hall

Amy Hurst, Assistant Professor, Department of Information Systems

As a person ages, they may have difficulty performing unfamiliar tasks which causes them to adopt new ways of working. We studied how to present data to a person about their performance in completing a task. We took an interdisciplinary and user-centered approach to investigate how to provide constructive visual feedback about performance to person, especially when the information may not be positive. Also, we have visualized methods to contextualize and display data of varying importance over time; and emphasized the socio-cultural influences on a user's perceptions and preferences regarding personal information and technology interventions. As a case study, we explored how to use the technique of information visualization to inform older adults about how well they were using the computer. We developed the idea using a previously collected dataset of mouse use metadata representing pointer performance and accuracy over time. We conducted a user study of our visualizations with older adults using real-time collected data. Through this project, we gained a better understanding of how users interact with data about themselves and ways we can help empower them to use this data for their own benefit.

This work is funded through a Collaborative Research Experience for Undergraduates (CREU) from Computer Research Association's Committee on the Status of Women in Computing Research (CRA-W).

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Developing Technique through Professional Studies

Paige S. Khoury

Doug Hamby, Professor, Department of Dance

The professional world of dance is a highly competitive field. The most successful dancers are those who have had a variety of dance training, working closely under professionals in the field. My research has found that dancers grow technically and artistically through continuous exposure to dance along with teaching others. My research involved studying under a variety of dance professionals at one of the world's most renowned dance intensives, American Dance Festival (ADF). At the six week festival, I studied technique, composition, improvisation, and anatomy through a variety of



different classes. I also had the opportunity to see twelve professional dance performances that featured renowned companies. It was this research that enabled me to learn a variety of choreographic and artistic tools. These tools have greatly expanded my personal ideas about dance and performance which helped develop my Capstone project in the course DANC 475. My research has contributed to the UMBC dance community through the creation of my project. Through the development of my piece, I educated fellow UMBC dancers on new choreographic techniques, the importance of anatomical awareness and injury prevention. My expanded awareness of the movement aesthetic, thus inspired me to use paint in the final production of my capstone project entitled “Catalyst.”

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education, the UMBC Dance Department Summer Research Grant, and Student Scholarship provided by American Dance Festival.

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Image Joins the Written Word: Artists Interpret Bartleby 2012

Laura Lefavor, Kayla Smith

Sally Shivnan, Senior Lecturer, Director of Writing and Rhetoric, Department of English;

Guenet Abraham, Associate Professor, Department of Visual Arts



This exhibit showcases the collaboration of UMBC’s student poets, fiction writers, and essayists with a select group of graphic design students, by displaying the design students’ visual interpretations of written works from the 2012 issue of *Bartleby*, UMBC’s creative arts journal. Each design student has produced an image for a particular poem, story, or essay, incorporating some or all of the text in the image. To ensure that each image is the artist’s own unique and independent interpretation, design students produced their work without the consultation of the authors. Authors were only permitted to see the visual interpretation of their work after it had been completed. The text of each written piece appears beneath its corresponding poster-size image. This project celebrates the release of *Bartleby 2012* and the work of its staff—an interdisciplinary effort involving students across many majors, who bring together writing and art from students throughout the university community.

This work was funded, in part, by the Undergraduate Research Initiative from the UMBC Office of Undergraduate Education, and the Student Government Association.

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Behind the Apple: The Culting of Macintosh Technologies

Elizabeth H. Locke

Donald I. Snyder, Lecturer, Department of Media and Communication Studies

Impromptu messages of grief and tokens of tribute, closely resembling rites of religious devotion, appeared in public spaces and on the Internet in response to the death of Apple Inc. CEO Steve Jobs in October of 2011. While it is clear that consumers in the twenty-first century place a high value on digital technologies, those loyal to Apple appear to go a step further in supporting, consuming, and connecting to the brand. The enthusiastic brand loyalty that Macintosh enjoys is unique among its competitors. What is it about Apple products that promote such avid faithfulness? Building upon literature that highlights the growing importance of brand identification, I conducted focus group interviews and to better understand the fanaticism behind Apple



products. In addition to analyzing the way Macintosh brands itself in television advertisements, I examined individuals who are loyal to Apple in order to investigate the relationship between consumption, identity and community. This study helps to explore the importance of branding and the role of new technologies in our global consumer society.

This work was funded in part by an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

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Analyzing Social Media Data

Morgan A. Madeira

Anupam Joshi, Professor, Department of Computer Science and Electrical Engineering

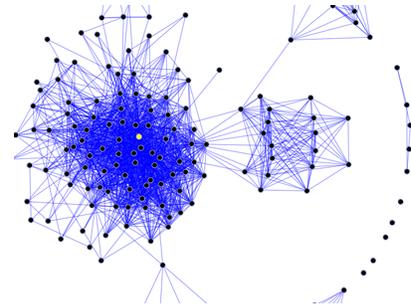
Social media has increasingly become an outlet for expression for a large part of our society. Literature suggests that analyzing data from these sites can lead to improvements in areas such as health-care and search-ad targeting.

Users of these sites often associate with many other users described as

“friends,” even if they do not have a strong connection, or what would be described as friendship in daily life. It is valuable to determine the strength of relationships between users and to identify communities within social networks. These communities represent people with similar characteristics, which are used by applications to solve many real-world problems. For instance, it is useful to identify groups that listen to the same type of music, are similarly affected by a natural disaster, or share health risks for a particular disease. We have created a system to collect and analyze the data about user characteristics, while being respectful of privacy concerns. The system is composed of a front end Facebook application and a back end machine-learning based tool. The front end component gathers data about a user and their friends. The back end uses the collected data and machine-learning techniques to determine relationships between users.

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

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Lead by Example

Charles Mason, III

Vin Grabill, Associate Professor, Visual Arts

This research addressed the problems that Baltimore City and County high school students faced when striving to obtain an education of value. The challenging issues investigated included stereotypical attitudes, peer pressure, lack of a support system, self-esteem and mental strength. After speaking with teachers, students and administrators from the schools I visited, I was able to

learn what conditions help students to stay focused, to increase their productivity, and to heighten their success rate in school. I then created six posters that expressed the challenges faced by youth as they pursued their education. These images will be displayed at URCAD at the Fine Arts Building Hallway Gallery. Following this exhibition, the posters will be displayed in some of the schools I worked with for the benefit of the students. As a result, students will gain a visual reference that will reflect the issues they encountered at some point during their educational



journeys. This research was important for its ability to reach across multiple ethnicities, because students of all races have experienced these forms of hindrance to gaining a quality education at one time or another.

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

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Reclamation and Resistance: Audiovisual Tools in Bolivia

Stefanie M. Mavronis

Jason Loviglio, Associate Professor, Department of Media and Communication Studies



The first years of the 21st century have been characterized by globalization, a shrinking of the world through neoliberal economic policies and shared networks of information. In the face of the global export of Western values and the legacy of hundreds of years of colonization, active and creative resistance movements have grown. Developing nations like Bolivia have enjoyed a thriving tradition of community media, and a new consciousness has emerged to organize this popular energy around the process of decolonization. Art and media technologies comprise one set of tools that have been used in Bolivia, a country with a majority indigenous population, in the struggle for freedom and independence from its forced historical legacy. This documentary film tells three stories of this resistance. Starting with the history of indigenous filmmaking, Aymara filmmaker Patricio Luna explains the importance of reclaiming indigenous identity. Then, sociologist Silvia Rivera and her art collective demonstrate the physical realization of decolonization theory through the construction of a community center in La Paz, Bolivia's capital. Finally, a group of young people in nearby El Alto discusses its innovative community television project that seeks to create content that is meaningful and reflective for their own community.

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

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Life Is Like Basketball

Martin Onuegbu

Frederic Worden, Associate Professor, Department of Visual Arts



Life Is Like Basketball is a narrative film depicting a young man's struggles in his life and makes use of the game of basketball as a metaphorical representation of those struggles. This short movie presents a dazzling array of action shots and makes use of special effects to tell an epic story of a boy named Ron battling a variety of foes. These battles unfold both on a basketball court as well as in an imaginary trial room in his mind. As the story progresses, the protagonist overcomes his foes through his determination as well as his fantastic basketball skills. This film is intended to be both entertaining, as well as an in-depth character study of a man striving to overcome the obstacles in his life. Both the visual imagery and the original musical soundtrack are designed to communicate and articulate the character's struggles. The hope is that the film will both entertain as well as make viewers think about the sources of inspiration that can be called upon to rise above some of life's more challenging obstacles. [\(Top\)](#)

Peptide Modification of 3-Dimensional Surfaces to Enhance Cell Adhesion and Differentiation

Belita A. Opene, Jared D. Romeo, Meghan M. McLaughlin, Sudheer K. Ravuri, Peter J. Rubin, Kacey G. Marra, Ellen S. Gawalt

Department of Chemistry and Biochemistry, Duquesne University;

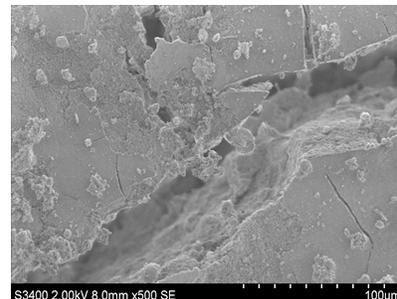
Department of Plastic Surgery, University of Pittsburgh

Peter J. Rubin, Plastic Surgeon, Department of Plastic Surgery;

Kacey G. Marra, Associate Professor, Department of Plastic Surgery;

Ellen S. Gawalt, Associate Professor, Department of Chemistry and

Biochemistry



Bone Tissue Engineering is an interdisciplinary field that applies the principles of biology and engineering to the development of viable synthetic substitutes that are able to restore and maintain the function of human bone tissues. The problem facing this therapy is that most cells fail to adhere properly to the scaffolds which lead to fibrous tissue formation around the implants. One strategy to solve this issue would be to immobilize a molecule that promotes cell adhesion onto the 3D scaffolds. This would ensure that cells adhere to the scaffolds, and it has the potential to enhance cell proliferation and cell differentiation. In this study, calcium aluminate (CA) was utilized as the scaffold. CA is a non-toxic, bioactive, and non-degradable material. CA also exhibits high mechanical strength and porosity. CA was modified by immobilizing the cell adhesion peptide Lys-Arg-Ser-Arg (KRSR) onto the surface via a novel chemical linker system. Cells of interest were primary human osteoblast and adipose-derived Stem Cells (ASCs). We hypothesized that CA surfaces modified with KRSR would enhance cell adhesion to the scaffolds as compared to unmodified CA. A cytotoxicity assay was used to determine cell viability on the scaffolds at day one, four and seven day growth points.

This work was funded by Pittsburgh Tissue Engineering Initiative and NIH

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Baltimore, We Love You

Shannon Palmer, Mawish Raza

Fred Worden, Associate Professor, Visual Arts

While technological advances have made it easier for information to spread virally, a catalyst is often required to start the process. “Baltimore, We Love You” is a social media project that uses film to promote awareness of the different levels of poverty that exist within the city of Baltimore. The film investigates homelessness, immigration/refugee policies and the state of the public school system. The film examines these issues primarily by exploring the personal experiences of individual Baltimore residents who are impacted by these situations and conditions. The intention of the film is to bring increased public awareness to the myriad of problems that exist within the city and to make these problems more understandable and more compelling by having real people describe them in their own voices. Based on statistics and research released by non-profit organizations, this campaign creates direct dialogue between with the impacted public in order to progress policy and action. This observational approach not only uniquely shapes the conversation of the film, but also personalizes the production process, due to the inability to ‘preplan’ the content. The use of audio-visual oral histories of actual poor people could provide the kind of catalyst necessary to mobilize public support for more concerted and effective efforts to address these wide spread problems of poverty and powerlessness amongst Baltimore’s underclass.

This work was sponsored, in part, by Amnesty International USA and The Roosevelt Institute | Campus Network.

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Philistines in the North? An Examination of Mass Migration to the Northern Levant in the Early Iron Age

Catherine Pasqualoni

Laura Wright, Lecturer, Ancient Studies



Early twentieth-century archaeologists argued that the Philistines, a people of Biblical acclaim, migrated from the Aegean to southern Palestine at the end of the Late Bronze Age (ca. 1200). For early archaeologists, the Bible and Egyptian texts offered definitive proof that this migration occurred.

Similarities in non-elite material culture supported this conclusion. In recent, influential excavations, Aegean-like material culture has been found in the northern Levant, prompting some scholars to identify a similar migration to this area. Re-evaluation of epigraphic evidence in light of recent linguistic advancements has been cited, which has led some scholars to identify this northern migration specifically with a Philistine population. This project re-evaluates the specific nature of that migration through an exploration of the very concept of migration (and its innumerable iterations) as well as an examination of the epigraphic evidence and material culture of the Northern Levant to determine if, in fact, there were Philistines in northern Syria.

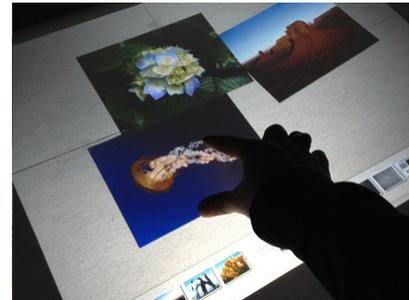
This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

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AccessMT: A Multi-touch Tabletop Built with Accessibility in Mind

Alec M. Pulianas

Shaun K. Kane, Assistant Professor, Department of Information Systems



AccessMT is an accessible multi-touch table designed with accessibility in mind. AccessMT is a self-contained hardware prototype consisting of a projector, computer, infrared lights, and a modified camera. Users can interact with AccessMT using simple touches, gestures, and tagged objects. The table tracks touch by using a PlayStation Eye Camera modified to capture only infrared light. The inside of the table contains four infrared lamps in order to create a consistent swath of infrared light. The inside walls are painted white for even distribution and diffusion of light. When a user touches the glass top, his or her finger reflects back infrared light and creates a bright spot. Using the open source software packages Community Core Vision and BSQSimulator, we are able to track a user's fingers and translate each of them into touch events. AccessMT builds upon prior multi-touch tables, but was designed to enable it to be easily adapted for use by people with disabilities. This presentation describes the challenges we have encountered and overcome in developing this new prototype.

This work was funded through an Undergraduate Research Assistantship Support (URAS) Award from the UMBC Office of Research Administration.

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The Impact of the Media in a Developing Egypt: National Policy vs. Collective Action

Mawish Raza

Brigid Starkey, Lecturer, Department of Political Science

Donald Snyder, Lecturer, Department of Media and Communication Studies



The works of theorists, such as Eric Hobsbawm, suggest that the integration of media within civil society evokes civil mobilization. The recent events in Egypt commonly referred to as the “Arab Spring” point to a new role for the media as a tool to express dissent and fight authoritarianism in the region. Throughout contemporary Egyptian history, the media has been used as an instrument by both the government and its dissenters to try to influence political opinion inside Egypt. For many decades, the government has had the ability to censor the role of media in Egypt. However, the events of the 2011 uprising have ushered in a new era. Using social media platforms including Facebook, Twitter and various news outlets, the demonstrators were able to move around traditional censorship and instigate and organize collective action against the regime of Hosni Mubarak. As dictated through the works of media theorists, the ongoing revolution provides a framework to discuss how media has encouraged stimulation within protests. With the incorporation of film excerpts and interviews that highlight changes in the role of the media from the Mubarak to post-Mubarak period, this research examines these changes and how they have impacted collective action against the government in Egypt.

This work was funded in part by an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

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The Effects of International Law on Civilian Populations

Eric M. Reitz

Jeffrey Davis, Associate Professor, Department of Political Science



Internal conflicts are a constant threat to world peace. This is evident by crises in the Middle East. The civilian population around fighting zones has borne a great deal of suffering. As a result, the international community has created standards, such as the Geneva Convention, and the Rome Statute of the International Criminal Court (ICC), to establish rules and guidelines for conflicts. The goal of these statutes is to limit the scope and effects of conflict. However, there has been uncertainty over the international community's enforcement the protections. I examined the legal protections afforded to civilians and argue that while the international community has taken great strides in prosecuting war crimes, they have not done enough. These international laws have not been strictly enforced, which has led to situations where war crimes are committed against civilians without any prosecutions. In the so-called War on Terror occurring in Afghanistan, analysis on various case studies has shown that the uncertainty over the United Nation’s actions has led to few prosecutions or publicized investigations. This is coupled with vague open-ended definitions of what is a war crime, causing problems over who should prosecute war crimes and how should they be punished.

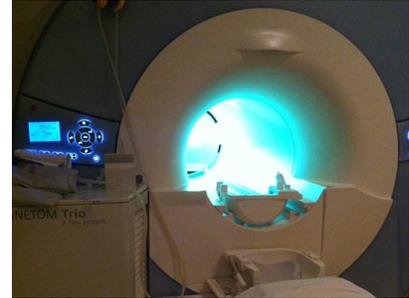
This work was funded in part by an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

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Introduction to a Language Acquisition Model

Rachel Robinson

Germán F. Westphal, Associate Professor, Department of Modern Languages and Linguistics



This paper presents an introduction to a theoretical model of language acquisition that incorporates the psycholinguistic principles of Generative Grammar on which the Theory of Principles and Parameters is based, and argues that the following conclusions follow in a natural and logical manner from such a model:

- (1) The [mental] Language Acquisition Device becomes functionally less efficient during puberty for reasons pertaining to its internal structure and related to the values on which the parameters of the first language are fixed.
- (2) First language acquisition involves setting the parameter values available in Universal Grammar (Chomsky (1989: 27-29), whereas post puberty language acquisition involves the creation of a new set of parameters in reference to the parametric values of the first language. In addition to the presentation of the above said theoretical model and relevant arguments, the paper elaborates on the neuro-linguistic correlations between such a model and several brain scans of monolingual and bilingual subjects. Given the theoretical nature of this paper, its methodology follows the principles of deductive argumentation.

This work was supported, in part, by a Travel Award from the UMBC Office of Undergraduate Education.

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Political Displays in Art Museums: How Italy Exhibits Objects Repatriated from the United States

Christina Ross

Richard Mason, Lecturer, Ancient Studies



Repatriated objects are antiquities that were smuggled out of a country and then later returned to their country of origin through international negotiations. They are a new 'genre' of items to be curated because they are politically charged. I visited the archaeological museums in Naples, Paestum, and Aidone in Italy and researched how each museum curated repatriated artifacts, which were previously exhibited as solely aesthetic objects in the United States. In the past two decades, numerous works, purchased for millions of dollars, have been returned to Italy from museums in the United States with no reimbursement on the basis that they are the cultural property of Italy. This link to modern politics, international cooperation, and cultural heritage makes them unique to study as a set and each museum handles the display in a different manner. I studied this by visiting each museum, observing the exhibit, and making note of how each was advertised, highlighted, or discussed within the framework of the museum. Ultimately, it was clear that the three individual museums each emphasized different agendas driven by such various influences as nationalist politics, the connection between art and human emotion, and local history.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education and a research abroad scholarship from the UMBC Department of Ancient Studies.

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A Digital Renaissance Experience

Hannah R. Skolnick

Bodil Otteson, Adjunct Professor, Department of Visual Arts

My research aimed to recreate the experience of Italian Renaissance art in the city of Florence for the average viewer. I created an interactive web page using motion graphics, maps, and images to explore specific works of artists featured in the museums of Florence. The importance of the Renaissance is widely recognized, however, many people outside of the art community don't have a comprehensive understanding of the period – its seminal works, defining artists, and foundational museums. An engaging and aesthetically appealing way to learn about these important characteristics of the Renaissance will involve the viewer more than any textbook or simple static image of the work can accomplish. Italy, and Florence in particular, is central to both fine art and contemporary design. My website utilizes stylistic techniques of graphic design to communicate the concepts and experience of the city's Renaissance art. The website is not live yet, and it will be presented at URCAD 2012.



This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education

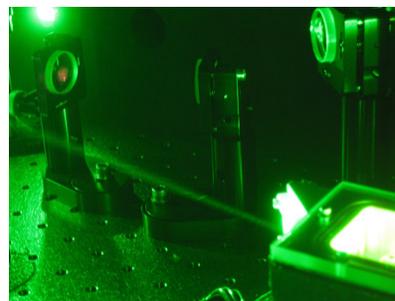
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Field Assisted Charge Dynamics in P3HT and P3HT/PCBM

David A. Sweigart

L. Michael Hayden, Professor, Department of Physics

We investigated the charge carrier dynamics in photoexcited solid films of regioregular poly(3-hexylthiophene-2,5-diyl) (P3HT) and P3HT/[6,6]-phenyl-C61-butyric acid methyl ester (PCBM) using optical-pump terahertz-probe (OPTP) spectroscopy in the presence of an electric field. Photo-generated charge carriers pairs were created in the films using 400 nm light from an amplified Ti:Sapphire laser. A sub-picosecond THz pulse then allowed us to monitor the dynamics of the electron-hole pairs and their subsequent evolution into either free or bound charges. This research was designed to better connect our OPTP laboratory experiments with device measurements in organic solar cells. Currently, high carrier yields of $\geq 60\%$ for such devices have been reported. However, the carrier yields reported using OPTP spectroscopy have been $\leq 1.5\%$. Our results attempt to determine whether this discrepancy was due to the fact that real world organic solar cells have an intrinsic electric field present throughout the material.



This work was funded, in part, by a grant from the National Science Foundation No. DMR 0120967 and an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

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Discovering New Dance and Choreographic Techniques

Kevin Truitt

Doug Hamby, Professor, Department of Dance

Dance is an ever changing art. The best way to improve as a dancer and choreographer is to study under professionals in the field. At the Bates Dance Festival, I studied for three weeks to improve my technique with the guidance of



dance scholars. My goal was to expand my knowledge on how the body moves. I studied modern dance techniques and vastly broadened my insight in dance composition, learning the importance of body movement and the functions of muscles. My research focused on personal advancement, specifically applying new ideas into my choreography. Under the guidance of JoAnna Mendl Shaw, I realized the importance of spatial awareness- how to use space in the best way possible. The study gave me insight into how to use expressive media, such as poetry, art or music to choreograph modern movement. To complete my research I choreographed a work on UMBC dancers using my new knowledge and awareness. I was able to provide the dancers in my work with hands-on experience in new methods of dance making. The final product of my research, “Cerebral Entrapment” was presented in the dance departments “Fall 2011 Senior Dance Concert.”

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education and the Summer Research and Study award through the UMBC Dance Department.

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Binding Studies of T4 Gene 32 Protein with dsDNA and a Sliding Model of Interaction

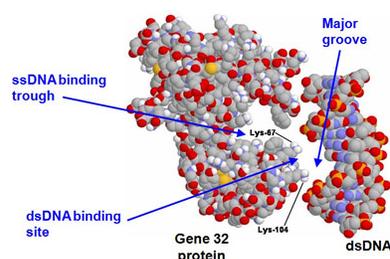
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Bacteriophage T4 gene 32 protein (gp32) is a classical single-stranded DNA (ssDNA) binding protein. gp32 is involved in DNA replication, repair and recombination. It is improbable that a collision of gp32 with the DNA would result in binding to the ssDNA patches. Thus, 3D diffusion alone will likely not result in the timely binding of single-stranded regions by the protein. We hypothesize that a positively-charged protuberance on the surface of gp32 (the “Leno chin”) binds to and slides along dsDNA until it encounters a ssDNA patch. The chin mutant, prepared by Mike Orlando, is a truncated version of gp32 lacking the C-terminal domain (CTD) with three of five lysine residues in the chin substituted with alanine. A spectrophotometric competition assay employing a DNA-binding cationic dye, azure A, and protein indicates that gp32 binds weakly to dsDNA. The truncate *III (core domain, lacking the NTD and CTD) has the highest affinity for dsDNA, followed by *II (lacking the NTD), whole gp32, and *I (lacking the CTD). The Leno-chin mutant has no measurable affinity for dsDNA, but fluorescence binding experiments shows it binds to ssDNA. We conclude that the binding sites for ssDNA and dsDNA on gp32 are different and a cluster of five lysine residues in the chin-like region is responsible for the interaction with dsDNA.

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The Effects of Rebalancing Frequency on Portfolio Performance

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Portfolio rebalancing is a tool that is often recommended by financial advisors, but rarely quantified more specifically in terms of frequency. Rebalancing a portfolio refers to the reallocation of funds between different asset classes, such as stocks and bonds, to match the targeted portfolio



allocations, such as a 50-50 split. As the market moves, it will cause the portfolio to deviate from the targeted allocation. This deviation requires the portfolio to be rebalanced. However, what is the optimal time frame, that investors should rebalance their portfolio? Using popular portfolio allocations, simulations over multiple time frames and the use of many sensitivity analyses, I have deduced an optimal rebalancing period. If investors were to wait five years to rebalance their portfolio, they would, on average, maximize their Sharpe Ratio (the standard risk-return statistic). This information is highly useful for portfolio managers in helping set and develop portfolio management practices and strategies.

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