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MESSAGE FROM THE EDITORIAL BOARD

USC Upstate is proud to announce the publication of the fifth volume of the USC Upstate Undergraduate Research Journal. This Journal provides a glimpse into a few of the many high quality research activities conducted by the talented faculty at USC Upstate. The Journal is a compilation of outstanding papers from numerous disciplines submitted by undergraduate students who have been involved in faculty-mentored research, scholarly, or creative activities. Undergraduate students involved in faculty-mentored extra-curricular projects enter the work-force with an enhanced skill set, including better problem solving, critical thinking, and team-working skills. Since many students who are educated at USC Upstate become employed in the region, support of academic research has a direct and positive impact on the Upstate of South Carolina.

We would like to express our sincere thanks to Stäubli for their generous funding of this Journal. Such support from prominent regional businesses is greatly appreciated and essential for the advancement of academic research in the Upstate. Stäubli is a mechatronics solution provider with three dedicated divisions: textile machinery, connectors, and robotics. With a workforce of over 3000, the company generates a yearly turnover surpassing 1 billion Swiss francs. Originally founded 1892 as a small workshop in Horgen / Zurich, Stäubli today is an international group with its head office in Pfäffikon, Switzerland. To learn more, please visit http://www.staubli.com.

We would like to thank the contributing authors for providing such a rich variety of outstanding articles on a broad range of exciting topics. A special thanks to Veronica Quick, Graphic Design Artist in the USC Upstate University Communications Office, for designing the outstanding cover of this volume of the Journal. Thanks also to Les Duggins for taking many of the pictures of the contributing authors. Many thanks to Elaine Marshall, Director of Sponsored Awards, for making the grant writing process at USC Upstate a smooth and often fruitful process. Finally, we would like to take this opportunity to thank Dr. Charles Harrington, Senior Vice Chancellor for Academic Affairs at USC Upstate, who is dedicated to enhancing faculty and student research efforts at USC Upstate.

If you have any questions or comments about the Journal, or would like to receive a printed copy of the most recent volume of the Journal, please contact Dr. Melissa Pilgrim, (864) 503-5781, mpilgrim@uscupstate.edu. The Journal is also available online, please visit the following website: http://www.uscupstate.edu/ResearchJournal.

Enjoy!
The Editorial Board
**THE EDITORIAL BOARD**

**DR. MELISSA PILGRIM**  
Editor-in-Chief

Dr. Pilgrim is an Associate Professor of Biology and the Director of Research. Her primary research focus involves an integrative approach to investigating how ecosystems respond to environmental change (natural and anthropogenic). She uses herpetological systems as her animal models and currently has an army of undergraduate students working with her in a research group called Upstate Herpetology. She has published works in several journals, including the following: *Isotopes in Environmental and Health Studies; OIKOS; Copeia;* and *Southeastern Naturalist.*

**DR. GAMAL ELNAGAR**  
Associate Editor

Dr. Elnagar is a Professor of Mathematics. His research interests include Optimal Control Theory in Climate Modeling and Economic Applications, Numerical Solution of Nonlinear Conservation Laws. He has published works in several journals, including the following international journals: *Computer Mathematics; Numerical Functional Analysis & Optimization; Computational & Applied Mathematics;* and *Differential Equations & Applications.*

**DR. NICHOLAS ROBERTS**  
Associate Editor

Dr. Roberts is an Assistant Professor of Management. His research interests lie in the adoption, diffusion and business value of information technologies, particularly in the areas of healthcare and virtual communities. He has published his work in several journals, including the following: *MIS Quarterly; Journal of MIS; European Journal of IS;* and *IEEE Transactions on Engineering Management.*

**DR. JUNE CARTER**  
Associate Director

Dr. Carter is a Professor of Spanish and Director of the Center for Teaching Excellence. Her research interests include Latin American narrative and film; Afro-Hispanic literature; Latin American female writers; US Latino/a literature. She has published works in several journals, including the following:*Anuario de Letras; Latin American Literary Review; Caribbean Quarterly; The Rocky Mountain Review; Prismatic Cabral;* and *Studies in Afro Hispanic Literature*.
Universities benefit substantially when faculty members are awarded external grant monies for research or service projects. Applying for grant opportunities is a very time consuming and tedious process which often times goes unrewarded since most opportunities are highly competitive with only a small percentage being funded. Grant monies are often used to support student research assistants and thus can have a very positive impact on a student’s academic experience. We would like to congratulate all USC Upstate faculty members who have recently been funded.

**ALL GRANT WINNERS (2011-2012)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Project Description</th>
<th>Amount</th>
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<td>Amendolair, Darlene</td>
<td>MUVE: Nursing Education</td>
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<td>Amendolair, Darlene</td>
<td>Mary Black Endowment: MUVE</td>
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<td>Child Care Access Means Parents in Schools (CCAMPIS) 2009</td>
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<td>The Possibilities Are Endless: Promoting Braille Throughout South Carolina</td>
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<td>AP Studio Art 2012</td>
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<td>Izzard, Marilyn</td>
<td>Unveiling Mathematics Standards Year 2</td>
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<td>Marlow, David</td>
<td>MGS: Survival of the Fittest: Increasing Tolerance toward Dialect in China</td>
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<td>Parker, Jennifer</td>
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<td>A Pilot Study Proposal for Spartanburg County District Seven Pre-Kindergarten Classrooms: Integrating the iPod into Preschool Curriculum</td>
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<td>Weber, Louanne</td>
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<td>Whittingham, Debra</td>
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<tr>
<td>Zhong, Wei</td>
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**TOTAL: $1,657,346**
NON-TRADITIONAL STUDENT SPOTLIGHT: SHAWNA WRIGHT

Shawna Wright is a first semester senior student in the Mary Black School of Nursing. She comes to USC Upstate with a B.A. degree in Experimental Psychology and a minor in Criminal Justice from the University of South Carolina Columbia and a M.S. degree in Clinical Psychology from Barry University. At USC Columbia, she was inducted into Psi Chi Honor Society. During her time at Barry University, she was the principle investigator for her thesis entitled, "Perceptions of Rape in Acquaintance, Marital, and Stranger Situations and the Impact of Gender." She presented her thesis work at the Barry University Thirteenth Annual Student Research Forum. Shawna was also an active volunteer with community based programs, working with Oxfam Carolina, Big Brothers Big Sisters, and missionaries in Rio de Janeiro, Brazil.

Shawna decided to transition into USC Upstate’s nursing program after working in the mental health field and recognizing the need for caring and competent health care professionals. In addition to her academic program requirements, Shawna works full-time on the third shift at Greenville Memorial Hospital and collaborates with Dr. Lynette Gibson on undergraduate research projects. She has received a mini-grant and two research assistantships through the Office of Sponsored Awards and Research support to investigate the “Thoughts, Feelings, and Beliefs about Screening Mammography held by African American Women.” Her work with Dr. Gibson has been instrumental, giving her a mentor who provides challenging and stimulating demands with a professionalism and compassion. After graduation, Shawna plans to work in a critical care unit and ultimately plans to pursue a Masters in Nursing Anesthesia at the University of South Carolina.

ALUMNI SPOTLIGHT: CHRISTINA HANDFORD

After graduating from high school two years early, I made the decision to enroll as a Pre-Veterinary student at USC Upstate. At the time I didn't really know what I wanted to do, so I decided to sign up for what everyone else wanted me to do, veterinary medicine. Shortly into my freshman year, I realized I loved my chemistry courses and found the subject fascinating. Dr. Bender, sensing my enjoyment, recruited me to change my major to Chemistry. I continued to enjoy the work in my chemistry classes and excelled in the subject. I found so many things fascinating in chemistry and decided to use undergraduate research to try and find something in chemistry that I really wanted to study. Summer of 2005 I did
computational research at Cornell University. Summer of 2006 I went to University of Arkansas to study ligand binding on nano-crystals. During my time at USC Upstate I did flame retardant polymer research with Dr. Rosario. As much as I found each of these topics fascinating, they did not stand out enough that I felt a desire to obtain a PhD in the field. I was having doubts about my future and decided I needed to take a break from school after graduating May of 2007. This decision led me straight back to animals, more specifically to a large pet boarding facility.

I started out cleaning kennels and supervising dogs playing in groups. My manager realized my potential quickly and over the next year I moved into the Assistant Manager position. The Assistant Manager position taught me a lot about my personal strengths. Things I never would have thought I was capable of in college were a part of my regular life. Now knowing my own strengths with people and with handling difficult situations, I started thinking about my long term future and realized that my current job was not leading me to a satisfying career. It did not use my full abilities and I would never be satisfied there. So, I started thinking about other options and found myself looking into veterinary school.

In the fall of 2010, I started researching requirements for veterinary school. I knew I would need more undergraduate courses and veterinary experience. In December of 2010, I signed up for Comparative Animal Physiology, an upper level biology course taught by Dr. Pilgrim. Dr. Pilgrim was yet another outstanding professor at USC Upstate. She encouraged me on the road to applying for veterinary school and took time out of her busy schedule to critique my personal statement. Dr. Pilgrim and Dr. Rosario both provided letters of referral for my application to veterinary school. I was accepted at Ohio State University and at University of Georgia.

Currently I am a DVM candidate for the Class of 2016 at University of Georgia College of Veterinary Medicine. After successfully completing my first semester of veterinary coursework, I know the USC Upstate faculty were instrumental in preparing me for the challenging curriculum. Dr. Bender was the first professor to encourage me to follow what I wanted and not what others said I should do. Dr. Rosario helped me in many ways during the pursuit of my B.S. in Chemistry, even though she was not my official advisor. Dr. Pilgrim took the responsibility of being my unofficial advisor when I returned to USC Upstate to complete the requirements for my application to veterinary school. I will forever be indebted to the wonderful faculty in the Chemistry and Biology Departments of USC Upstate. I would not have made it to where I am today without your help.
Ana Osuna is a first year student at the Charlotte School of Law and recent graduate of USC Upstate. Osuna graduated in May with two specialized degrees in Spanish and Business Administration with a focus in Marketing. Since her freshman year, she was driven to make a positive impact through her academic endeavors at the University of USC Upstate. One of her lifetime goals has been that of helping Hispanics in the Upstate community through legal assistance, hence she is currently pursuing a Juris Doctor and plans to return to the Greenville area to practice law and serve the community.

While a student at Upstate, Osuna was an exemplary leader, serving as president of several student organizations: Hispanic Awareness Association, Nu Iota Chapter of Alpha Mu Gamma National Collegiate Foreign Language honor Society, and the Women's Leadership Network. She was also an active member of the International Club. She was elected president of the Student Government Association during her senior year, becoming the first Hispanic to hold that office at USC Upstate. Serving the student body was great preparation for her future goal of serving the community. “As president of the Student Government Association, I had the opportunity to work with a very diverse group of student senators.”

Ana is grateful for the academic training she received from USC Upstate, which prepared her for her current academic pursuits in law school. “Law School can be intimidating regardless of your background, but I am thankful I had professors like Dr. June Carter who used the Socratic Method of instruction because that is how my law professors conduct their classes. Getting called on in my classes is not as traumatic for me as it is for some of my peers, because USC Upstate gave me an advantage.”
This past November, the USC Upstate Model United Nations team competed at the Southern Regional Model United Nations Conference in Atlanta. USC Upstate represented the Arab Republic of Egypt at the Conference, which included over 700 delegates representing eighty countries. Our students put in countless hours of preparation for the conference, learning about international law, diplomacy and negotiation, as well as current international issues. The top ten percent of countries represented at the conference are recognized for their efforts by receiving the Outstanding Position Paper Award. This award is, statistically, the second most difficult award classification to obtain at the conference. I am pleased to report that Egypt received this award! The USC Upstate team was the only new delegation to receive the award. We were also the only club team (student participation was completely voluntary and not part of any class) to receive an outstanding position paper award.

Ten students traveled with Dr. Trevor Rubenzer to the conference. They were Joel Gregory (Head Delegate), Nicolaj Gericke, Amy Yancey, Catherine Estupinan, Ashton Gottschall, Samuel (Giften) Hines, Elizabeth Mitchell, Jonathan Eames, Morgan Jones, and Brandon Lybrand. They did a superb job representing their country and university. Pages 8 - 21 feature the team position papers.
Position Paper for the Food and Agriculture Organization

1. Developing and Examining Local, Regional, and Global Strategies to Reduce Food Price Volatility

Egypt is deeply concerned by excessive volatility of commodity prices and by the impact that excessive price volatility has on food security and sustainable development in developing countries, and, in particular, by the fact that many commodity dependent developing countries and economies in transition continue to be highly vulnerable to excessive price fluctuations. Egypt also recognizes the need to improve the regulation, functioning, and transparency of financial and commodity markets in order to address excessive commodity price volatility.

As the world’s largest wheat importer, Egypt is increasing its domestic grain production in a bid to reduce its dependency on volatile international markets and to meet rising demand from its 85 million people. However, with rising production unlikely to satisfy domestic consumption, import volumes are expected to rise in the coming three years. The improved cultivation figures come about as a result of several factors. Rising purchase prices and the use of better seed has already paid dividends; other moves that could support production increases include encouraging greater consolidation and mechanization of farms. The past year has also seen renewed interest in Egypt’s two biggest desert-reclamation agricultural schemes, Toshka in the far south, and the North Sinai Agricultural Development Project (NSADP) on the Sinai Peninsula, which together would see around 400,000 ha of desert converted for agriculture. In February 2012 the government announced it had completed 94.4% of the infrastructure for the NSADP, including irrigation canals, pumping stations and bridges.¹

Egypt heavily depends on imports and its own food subsidy program to ensure food security for our people. Egypt is acutely aware of its limited arable land and water resources. Among other measures, the government reduced import tariffs on food items during 2008 to their lowest levels in four years, while also imposing an export duty on rice, before entirely banning rice exports in April 2008. The ban resulted in a drastic decrease in exports for the year 2008. Given that poverty, food insecurity and malnutrition is heavily concentrated in Upper Egypt, where 70 percent of the poor live, the Mission recommends urgent action in support of the development of a short- and medium-term program specifically targeting Upper Egypt. This investment program should be developed along the twin-track approach of (i) enhancing immediate access to food and better nutrition, and in strengthening the productive capacity of the most food insecure and vulnerable, while (ii) ensuring increased resilience of rural livelihoods through investment in agriculture, and in food security and nutrition programs.² Egypt would welcome the support of all states, especially developed countries, in implementing national food self-sufficiency strategies.

Egypt’s reliance on imports means that it is particularly vulnerable to fluctuations in global food prices and makes government safety nets vital to protect the poor. In an exclusive interview with Ahram Online, Shukri Ahmed, senior economist at the UN’s Food and Agriculture Organization, praised Egyptian efforts towards agricultural self-sufficiency but said the country remains at risk. Ahmed said Egypt was clearly seeking to increase agricultural yields by developing new methods but warned that expansion should take into account Egypt’s limited natural resources and the needs of its population.

Water savings in agriculture are an important objective of Egypt’s water strategy to serve a growing population with limited resources. Agriculture was first assessed through pilot projects under the USAID-supported Egypt Water Use and Management Project (EWUP) begun in 1977. The pilots showed that in order to achieve water savings, it was important to allow farmers to participate more in irrigation management through water user associations, to provide continuous flow instead of rotational flow in branch canals, to replace individual by collective pumping, and to create an irrigation advisory service. The North Sinai Development Project, the New Valley Project, and the West Delta Region Project are all plans for future infrastructure projects for irrigation improvement. The FAO should be encouraged to assist in these types of projects throughout the developing world.

Egypt underlines the importance of timely, accurate and transparent information in helping to address excessive food price volatility, and in this regard takes note of the Agricultural Market Information System hosted by the Food and Agriculture Organization, and urges the participating international organizations, private-sector actors and governments to ensure the public dissemination of timely and quality food market information products. Egypt requests that all relevant United Nations agencies and other international organizations, in particular the Food and Agriculture Organization and the United Nations Conference on Trade and Development, to participate actively in the high-level thematic debate and to continue their research and analysis on this matter.

2. ADVANCING CAPACITY DEVELOPMENT IN INFORMATION SYSTEMS: INCREASING ACCESSIBILITY TO FOOD AND NUTRITION DATA

Egypt is confident with the current development of technology used to gather information and data, which contributes, to the planning and development of our food and agricultural sectors. The further improvements of computers and Internet connectivity have lowered the barriers to sharing and collecting data as well as information in order to achieve developing states aspirations of food self-sufficiency. Recent approaches by the Food and Agriculture including the development of FAOSTAT, have helped to improve data

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Another element Egypt believes needs to be addressed is the growing digital divide. Our country, as well as our region, is equally affected by the lack of digital sources to collect enough data and information, which will help us to improve and further advance capacity development in the information system. Egypt believes that we can overcome the gap by balancing the Internet infrastructure and making it equally accessible regardless of income, race, ethnicity, or gender. Increased technology transfer from the developed world will help narrow the digital divide further. Any solution to the problems of data sharing and management must also address the lack of knowledge and understanding of such technology. Cooperation among central governments, local public authorities, the private sector, academia, civil society and international organizations is an important factor and all stakeholders should act upon the guidelines of the Tunis Agenda. FSIC, Egypt's Food Information Security System has been a successful approach to support food security policies, strategies, program planning and interventions with adequate information which we believe can be a model for many countries in our region.

3. EXAMINING AND ADDRESSING THE IMPACT OF FOOD INSECURITY ON GENDER RELATIONS

Social and economic inequalities between men and women undermine food security and hold back economic growth and advances in agriculture. By mainstreaming gender equity into all of its programs for agriculture and rural development, Egypt urges the FAO to continue to aim at strengthening the impact of its support to member countries, and achieving the goals of gender equality, the eradication of hunger and poverty, and food security for all.

A new $3 million project that aims to improve food security and nutrition of women and young people in Egypt was announced recently by the FAO. Health surveys in Egypt have shown that malnutrition is the root cause of over one third of sicknesses affecting children under the age of five. The project aims to improve food and nutrition security through higher food production, nutrition education for women and young people and capacity building to strengthen national and decentralized institutions. The project will establish Junior Farmer Field and Life Schools and Community Model Gardens to give women and young people the opportunity to manage their own micro food production enterprises, to learn how to grow food and to raise small animals, and to improve household incomes through the sale of food products. Egypt looks forward to working with its developing brethren toward the expansion of these types of programs.

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6 “Food and Agriculture Organization of the United Nations - for a world without hunger”
   http://faostat.fao.org/
7 “The Role of E-Governance in Bridging the Digital Gap”
   http://www.un.org/wcm/content/site/chronicle/home/archive/issues2011/thedigitaldividend/theroleofegovernanceinbridgingthedigitaldivide
8 http://fsic.hopto.org/
9 “New Food Security and Nutrition Project for Egypt”
Egypt urges the FAO and all other relevant United Nations agencies to push towards the third Millennium Development Goal, “to promote gender equality and empower women.” The goal sets a target of eliminating gender disparity in all levels of education by 2015. Undeveloped countries stress the need to strengthen the capacity of smallholder and women farmers as a strategy to enhance agriculture development and food security by promoting equitable access to land, water, financial resources and technologies in accordance with national legislation. Eliminating the gap between men and women in access to agricultural resources and inputs would raise yields on women’s farms by 20-30 percent and increase agricultural production in developing countries by 2.5-4 percent, which could in turn reduce the number of undernourished people in the world by 12-17 percent or 100-150 million people. We note that gender inequality in agriculture is a problem not just for women but also for the agricultural sector, food security and society as a whole.10

POSITION PAPER FOR THE ECONOMIC COMMISSION FOR AFRICA

1. EXAMINING THE ROLE OF STATE GOVERNMENTS IN ENCOURAGING AND MANAGING ECONOMIC DEVELOPMENT

While Egypt is encouraged that economic growth rates continue to accelerate on the African continent, the fact remains that over one billion Africans currently live below the global poverty line.11 Increasing economic and human development in Africa will require new and additional resources from the developed world and various multilateral lending institutions. In addition, the battle against enduring poverty will require a renewed effort to integrate poverty reduction strategies into structural adjustment programs (SAPs). During the 1990s, the launch of the Highly Indebted Poor Countries (HIPC) Initiative resulted in an increased focus on poverty alleviation. The launch of the Multilateral Debt Relief Initiative (MDRI) in 2005 accelerated global progress on debt relief. Egypt looks forward to working with its African brethren in order to expand the MDRI to include more developing countries. In addition, Egypt lauds the ECA finding that debt relief for HIPC countries translates directly into better access to health care.12 These findings highlight the need to expand access to debt relief throughout the African continent.

Egypt remains convinced that the state, in cooperation with private industry, has a critical role to play in economic development. Egypt is pleased to report that since the election of President Mohamed Morsey consumer confidence has risen dramatically according to Regional Director Stakeholder Melissa Baker of TNS Egypt, a market research

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10 “The Vital Role of Women in Agriculture and Rural Development”
http://www.fao.org/docrep/meeting/022/mb054e.pdf

11 Statement by Egypt included in the Report of the African Regional Preparatory Meeting

http://repository.uneca.org/bitstream/handle/10855/3334/bib.%20272786_1.pdf?sequence=1
company. Additionally, President Morsey is seeking to attract foreign investments to bolster the economy and create job opportunities, according to presidential spokesperson Yasser Ali. Finally, Egypt is currently working on economic restructuring with the IMF in an effort to stabilize the economic climate left from our recent governmental transition. The role of the ECA, the African Development Bank, and other African development partners should be primarily to support, logistically and financially, national development initiatives. Many of the harsh austerity measures imposed as conditions for aid in the past lead directly to increased political instability. Endogenous capacity building will require a renewed emphasis on aid without conditionality.

Finally, Egypt expresses its concern that the global financial crisis will result in decreased official development assistance (ODA) flows into Africa. As the preparatory committee for the 2012 African Economic Conference points out, recent increases in commodity prices do not compensate for decreases in ODA (especially in an environment where many African countries lack the financial infrastructure to take advantage of price increases). One of the primary functions of the ECA is to provide technical assistance as it relates to various economic issues. Egypt looks forward to the negotiation of agreements that will increase the level of technical assistance through the development of consolidated appeals for resources by the ECA through ECOSOC.

2. ADDRESSING THE EXPLOITATION AND MISMANAGEMENT OF NATURAL RESOURCES AT STATE AND REGIONAL LEVELS

Egypt is blessed with significant natural gas reserves and is proud to announce the recent discovery of a deposit of between four and six billion feet of natural gas on the Nile delta by Dana Gas Company. As the largest non-OPEC oil producer and second largest producer of natural gas in Africa, Egypt understands the necessity for proper management of natural resources. In this context, Egypt supports the effort at the 2012 meeting of the African Development Forum (ADF VIII) to disseminate best practices with regard to natural resource management. Furthermore, Egypt recognizes that the development of natural resources must take place within the context of good governance. Egypt’s recent transition to popular rule creates tremendous opportunities to correct natural resource mismanagement errors that have occurred in the past. All African countries, including Egypt, however, will need access to development financing free from political conditionality in order to implement national and regional resource exploitation strategies. In addition, as the host of the 2006 United Nations Expert Group Meeting on Natural Resources and Conflict in Africa, Egypt is fully aware of the nature of the resource curse. Egypt believes that the key to peaceful natural resource exploitation, as outlined at the 2006 meeting, is downward accountability in the area of resource allocation. Specifically, Egypt will propose that all members of the ECA and of the African Union integrate
downward accountability into their resource management processes. This is the only way to ensure that, consistent with the goals of the recent Egyptian political awakening, natural resources are used for the benefit of the people.

By far, the most precious natural resource in Egypt is water. Access to potable water is a significant issue to Egypt, especially in light of the decision of certain African states to begin development projects along the Nile River that will significantly reduce the country’s access to fresh water. With this in mind, Egypt will work with other ECA members to call for the development of water access agreements in Africa modeled after those developed under the auspices of the Arab Water Forum. Regional water management strategies, especially amongst countries dependent on the Nile for access to water will be a key part of any agreement. While the ECA does not directly engage in peace negotiations, it is the proper forum for the provision of technical and logistical assistance with regard to the implementation of water access agreements.

3. ACCELERATING PROGRESS TOWARDS MEETING MDG #1: THE ERADICATION OF EXTREME POVERTY

Africa, unfortunately, is home to more people living in extreme poverty than any other region on Earth. In spite of this tragic fact, Egypt is honored to point out that its national commitment to alleviating poverty has acquired much momentum with the adoption of the goal to reduce poverty to fifteen percent by 2011/12. We have already achieved international commitment directed towards reducing to half extreme poverty based on one dollar per day. Furthermore, we have also articulated a package of actions and programs to empower the poor such as, ‘Geographic Targeting’ and ‘Supporting Most Vulnerable Families’, in addition an integrated package of social policy reforms. Egypt’s strong concern over the need to reflect shorter-term trends has resulted in the decision to monitor poverty every two years as oppose to the usual five years. Each of these programs in Egypt could provide a model for other ECA members struggling with poverty alleviation. However, as noted above, Egypt is convinced that poverty alleviation will required a renewed commitment by developed countries and multilateral lending institutions to forgive significant portions of African debt on a non-discriminatory basis. Egypt is pleased to pronunce the effectiveness of the volunteer effort ‘Sailing the Nile for the Millennium Development Goals’. This yearly outreach project is aimed at helping communities build the capacity to implement the MDGs through volunteerism. Eight feluccas stop at eight Nile communities to show residents how they can begin their own volunteer projects to implement the MDGs. This event unites some eighteen partners, including the UN; the government; civil society and the private sector; and members of the media, academia and local communities. Also, Egypt firmly supports civil society organizations educational networks on MDGs in lower HDI governorates in Egypt, which

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focus on setting the platform for the localization of MDGs through empowering civil society actors to mobilize communities and take collective actions in support of the MDGs.²¹

POSITION PAPER FOR THE PEACE BUILDING COMMISSION

1. ORGANIZATIONAL COMMITTEE, NAGORNO-KARABAKH REGION

Egypt possesses a unique ability to help shape a lasting peace based on cooperation and development in the disputed Nagorno-Karabakh region. As one of the first Islamic states to recognize the independence of Armenia, Egypt has always maintained a significant relationship with the country. At the same time, Egypt has also sympathized with its Muslim brethren in Azerbaijan. As a result, Egypt is one of the few countries recognized as being sincerely neutral with regard to the underlying identity-based conflict the region. Egypt's recommendations for the Peace Building Commission are based on this understanding of the conflict.

First, as the European Union’s Crisis Management Initiative has pointed out, one of the barriers to peace building in Nagorno-Karabakh is the lack of coordination between mediators, peace-building organizations, and elements of civil society working in the region.²² Egypt strongly recommends that the Committee empower the European Partnership for the Peaceful Settlement of the Conflict over Nagorno-Karabakh (EPNK) to serve as a central coordinating body on behalf of the Peace Building Commission. The EPNK has recently begun the second stage of its peace building effort in the region.²³ Egypt agrees with the EPNK that the key to successful peace building in the region is the cultivation of civil society, which for decades had previously been actively discouraged by all parties to the conflict. The cultivation of person to person contacts will also be critical to crafting a lasting peace in the region. This must be accomplished on the basis dialog, rather than contending petitions for recognition.

Second, Egypt notes that the concept of post-conflict peace building as developed by former Secretary General Boutros Boutros-Ghali in An Agenda for Peace will require significant amounts of economic assistance aimed at the cultivation of cooperative development projects among former combatants. The EPNK is well-positioned in this regard, while the troika of France, Russia, and the United States, working within the Organization for Security and Cooperation in Europe’s Minsk Group, are best positioned to continue efforts toward a more lasting solution to the conflict on the basis of Security Council Resolutions 853,874, and 884. Egypt is concerned that the most recent meeting of the Minsk group in September of 2012 noted the lack of substantive progress in recent months.²⁴

Finally, Egypt notes that the situation in Nagorno-Karabakh is emblematic of self-determination struggles in many parts of the world. In this context, Egypt would

²¹ http://egypt.unv.org/mdgs/sailing-the-nile-for-the-mdgs.html
²⁴ OSCE Minsk Group Press Release http://www.osce.org/mg/94390
encourage the Peace Building Commission, as well as the Security Council itself, to apply the same pressure on those states in the Middle East currently occupying territory that they are currently applying on the parties to this dispute.

2. WORKING GROUP ON LESSONS LEARNED, CENTRAL AFRICAN REPUBLIC

One of the primary lessons learned as a result of PBC activity in the Central African Republic is that it is impossible to implement a reconciliation strategy if the international donor community is unable to fund the endeavor. For example, the PBC, in cooperation with the parties to the disputes in Chad and the CAR, developed a strategy designed to reintegrate former rebel groups into society. The most recent report of the PBC however indicates that the necessary resources to implement the strategy were unavailable. The lack of funding represents a significant failure of the international donor community. It is of vital importance that the PBC Peacebuilding fund and the United Nations Development Program’s Crisis Prevention and Recovery fund be fully capitalized at all times.

Egypt believes that a related lesson can be learned by studying the reaction of the Bretton Woods Institutions, especially the International Monetary Fund, to the crisis. The IMF was unwilling to exhibit flexibility with regard to standby arrangements for stabilization funds. For its part, the PBC was unable to convince the IMF to be more flexible in its approach. In future peace building configurations, it will be necessary for those members of the PBC who also hold significant voting power in the IMF to act as a bridge between the two organizations. Clearly, the type of cooperative development necessary for lasting reconciliation cannot occur amidst a backdrop of crushing debt.

Third, the Central African Republic, in coordination with the PBC Steering Committee, developed a comprehensive and workable disarmament plan. However, the Committee disbursed the funds at such a slow pace that the disarmament process faltered. Least Developed Countries like the CAR lack the capacity to make up for these shortfalls. The CAR also noted that overhead costs related to fund expenditure were very high (averaging seven percent). It is the responsibility of the PBC to reform its fund allocation processes to lower overhead costs, especially with regard to disbursements to LDCs.

Finally, Egypt believes that it is important in the future for the PBC to better recognize regional linkages as part of the effort to create durable peace in heterogeneous counties like the Central African Republic. The PBC, at the outset of its efforts, did not pay enough attention to not state actors like the Lord’s Resistance Army. As a result, the conflict with the UFDR did not signal the end of all hostilities in the country. In addition, the domestic nature of the conflict resulted in thousands of prisoners, many of whom did not have proper access to basic necessities like water. The PBC must act in the future to recognize the complex nature of these humanitarian emergencies.

3. COUNTRY-SPECIFIC CONFIGURATION, BURUNDI

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Burundi completed its second Poverty Reduction Strategy Paper (PRSP) in August of 2012. Egypt agrees with the assertion in the second PRSP that the time has come in Burundi to switch from a strategy of short-term economic stabilization toward the development of long-term job creation strategies. Burundi’s prepared budget will require new and additional resources and the additional cancellation of debt by multilateral lenders like the World Bank and bilateral lenders through the mechanisms provided by the Paris Club of bilateral creditors. It appears, from the results presented in the second PRSP that the urban-rural gap, both with respect to healthcare and economic development, is widening in Burundi. Given Burundi’s limited infrastructure and the lack of efficacy of its bureaucracy, it is not clear whether this gap can be narrowed during the period of the second PRSP.

With regard to the Strategic Framework for Peacebuilding in Burundi, Egypt believes that the Partner’s Coordination Group continues to represent the best chance for continued consolidation of peace, development, and democracy at all levels. Specifically, the integration of civil society, including national and international NGOs, into the Partner’s Coordination Group, offers the only real possibility for the development of robust political institutions. Egypt encourages all stakeholders to continue and enhance their level of engagement.

Finally, with respect to the Monitoring and Tracking Mechanism, it appears that one of Burundi’s greatest remaining challenges is government corruption caused by comparatively weak governing institutions. In many ways, this is symptomatic of the decision by many former colonial powers to support dictatorships in Africa (until relatively recently). Egypt does agree with the most recent conclusion of the Monitoring and Tracking Mechanism that Burundi should be encouraged to enact stronger anti-corruption legislation.

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**POSITION PAPER FOR THE GENERAL ASSEMBLY PLENARY**

1. **ASSESSING THE IMPACT OF LONG-TERM REFUGEE CAMPS, SQUATTER VILLAGES AND SLUMS IN DEVELOPING MEMBER STATES**

   Egypt is heartened by the fact that, according to Secretary General Secretary General Ban Ki-Moon in the Millennium Development Goals (MDG) Report Card 2012, Target 7.D (achieving a significant improvement in the lives of at least 100 million slum dwellers) has been met and exceeded. In spite of this achievement, however, much work remains to be done. The African continent, especially sub-Saharan Africa, continues to see relative growth in its slum population. In addition, according to Egypt’s most recent submission to the United Nations Development Program (UNDP), the proportion of urban-dwellers

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remains higher than the average for all North African countries.\textsuperscript{30} Egypt has always been proactive on this issue, having begun its own slum improvement program in 1993. The program focuses on improving access to potable water, improving dwelling conditions, and raising awareness of the problem in the country as a whole. Egypt recognizes that new and additional resources from the United Nations, its specialized agencies, and the international donor community will be necessary to fully implement national capacity building strategies on a non-conditional basis.

In addition to directly addressing the problem of conditions in slums, Egypt recognizes that the root causes of the issue must be addressed as part of any attempt to move beyond existing goals. In 1986, this committee passed the Declaration on the Right to Development.\textsuperscript{31} The Declaration recognized the legacies of colonialism and neo colonialism and their adverse impact on the developing world. In his speech to opening session of the General Assembly, president Morsey pointed out that the practice of world powers supporting corrupt authoritarian regimes creates further impediments to development. In this context, Egypt believes that ameliorating conditions in slums requires a change in the attitude of world powers toward their responsibilities, especially their pledge to contribute .7 percent of their gross national products to Official Development Assistance (ODA). First agreed to in 1970, most developed countries have yet to meet this pledge. Indeed, the UN has recognized that meeting this pledge is a key element in meeting many of the MDGs.\textsuperscript{32}

Finally, Egypt recognizes that improving the basic human dignity of those living in slums requires that the UN encourage member states to enact domestic legislation in several key areas, while always bearing in mind the restrictions imposed by Article II, Section 7 of the UN Charter. For example, Egypt has adopted an Institutional Framework in Support of Water Quality Management in cooperation with the World Bank. This framework includes a decreased reliance on pesticides, increased private-public partnerships, and various crop rotation strategies. Implementing this framework has directly resulted in increased access to piped drinking water in many Egyptian slums. Clearly, the available of concessional sources of funding from multilateral lending institutions such as the World Bank, the regional development banks, and bilateral sources will be critical to further improving conditions in slum areas.

2. RESOURCE SCARCITY: COMBATING THE DEPLETION OF NATURAL RESOURCES AND ADDRESSING THE NEED FOR RENEWABLE ENERGY

Egypt commends the international community’s efforts to address the dwindling supply of natural resources and the advancement of renewable energy. Despite the progress made by the Rio +20 Conference on Sustainable Development, the predicament the world community faces demands further action. Egypt expresses concern for the decrease in available natural resources and the continued increase in demand. Although Africa and the Middle East are rich in mineral wealth, the availability of clean water continues to plague the region. Egypt believes that resource security is central to achieving the MDGs. The African Union has affirmed its commitment to the issue through The

\textsuperscript{31} A/RES/41/128
Convention on the Conservation of Nature and Natural resources, as well as the Climate Change and Natural Resource Management Program.\textsuperscript{33} In addition, Egypt has established The National Environmental Action Plan (NEAP) in conjunction with the UNDP, which lays out a strategy for economical and environmentally sustainable development.\textsuperscript{34} Egypt also created the Sixth Five Year Plan, which created mechanisms to improve waste management, air and water quality, and to eliminate industrial pollution.\textsuperscript{35}

Egypt endorses the international community’s proactive approach in addressing the resource problem, but insists the issue of resource depletion needs the full focus and commitment of the international community. In addition, Egypt applauds the accomplishments of the developed world, but reminds them of their responsibility to the developing world. Egypt notes the success of European Union desalinization projects headed by Joachim Koschikowski that constructed solar powered water treatment plants in developing areas.\textsuperscript{36} Egypt recommends that OECD states renew their commitment to sharing knowledge and technology for resource consumption and conservation. Egypt further requests that developed states pledge non-conditional new and additional resources to implement environmental measures, and sustainable development.

\section*{3. Developing Strategies for Disaster Risk Reduction and Economic Mobility in a Turbulent Economy}

Egypt is reassured by Secretary General Ban Ki-Moon’s recent commitment to disaster risk reduction noting that disaster risk reduction is an integral part of “achieving the Millennium Development Goals and building a truly sustainable world for all.”\textsuperscript{37} Although much has been accomplished since the World Conference on Disaster Reduction in Hyogo, there is still progress to be made. The African continent has been plagued by disaster in recent years including: HIV/AIDS, cholera, malaria, earthquakes, and droughts. The African Union in coordination with the International Strategy for Disaster Reduction (UNISDR) recognized disaster risk reduction as essential to poverty reduction and sustainable development by forming the Regional Strategy for Disaster Risk Reduction.\textsuperscript{38} In addition, Egypt established the National Committee for Crisis Management and Disaster Risk Reduction (NCCMDRR) in 2006 in accordance with the Hyogo Framework of Action’s (HFA) five priorities. Egypt also recognizes that developing countries are disproportionately affected by natural disaster due to a lack of preparedness. In a statement the 66\textsuperscript{th} Session of the UN General Assembly, the Group of 77 stated that natural disasters cause “long-term

\begin{itemize}
\item \textsuperscript{37}United Nations, Secretary-General SG/SM/14226 GA/11226, Department of Public Information, News and Media Division, New York; When Disaster Risk Reduced, Chances of Building Truly Sustainable World For All Increases, Secretary-General Says in Message to Interactive Thematic Debate; 12 April 2012 http://www.un.org/News/Press/docs/2012/sgsm14226.doc.htm
\end{itemize}
negative social, economic and environmental consequences for countries, particularly developing countries.”

Egypt applauds the contributions of the Development Assistance Committee of the Organization for Economic Co-operation and Development (OECD-DAC) for their contributions, and urges the greater international community to pledge new and additional resource, technology, and expertise in order to implement national disaster risk reduction strategies.

Egypt also applauds the progress made by the UNISDR through the promotion of capacity building measures that allow governments to anticipate, respond, and recover from disasters. In addition, Egypt reminds the international community to remain focused on long term recovery, poverty reduction, and sustainable development. Egypt encourages member states to pass domestic measures to build government capacity to respond effectively to disasters. Egypt commends the progress made by UN-HABITAT in providing adequate and sustainable shelter in response to disaster. In addition, Egypt notes the success of the Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) and expresses its hope for further technological assistance and transfers from OECD countries. Keeping in mind Article 55, Section A of the UN Charter, it is the responsibility of the international community to promote conditions for economic progress.

In spite of the progress made, Egypt requests that the developed world reenergize their efforts to address the underlying issues of poverty reduction and sustainable development.

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**POSITION PAPER FOR THE LEAGUE OF ARAB STATES**

1. RESPONDING TO EXTERNAL THREATS TO ARAB STATE AND REGIONAL ECONOMIES

Throughout its history Egypt has had to deal with the reality of external threats to its existence. From the Arab-Israeli Wars and illegal Israeli occupation of Egyptian territory, to current threats concerning the Suez Canal, Egypt has faced much adversity. There have been many attempts made by the League to help protect Member states from outside threats to state and regional economies, but most of these have not had the desired impact. The main reason for the ineffectiveness of previous League actions is the lack of Arab unity. Through its participation in the founding of the United Nations, the League of Arab States, and its participation in many other regional endeavors, Egypt has demonstrated its commitment to the realization of Article II of the League Charter, building closer relations between Member States.

The dedication of the League itself to this unity was reaffirmed at the 2012 Arab Economic Summit, held in Riyadh. Although there have

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been several attempts throughout the history of the LAS to create a more coherent and unified League, such attempts have never quite been successful.

The level of cooperation that is needed can and be achieved in several different areas. Most importantly, the idea of a Pan-Arab free trade zone should be revisited by the Economic and Social Council of the Arab League. Currently, only ten percent of the trade output of Arab League states is actually generated within the Arab League. The creation of a Pan-Arab free trade zone would help to foster closer relations between member states, and would also help to promote economic diversity. Diversifying the economies of Member States will add to stability by reducing dependence upon a single resource. Economic diversity would be better realized by all Member States if there were a more open flow of technology and resources between Member States. In this context, Egypt urges the developed world to consider increased technology transfer on a concessional basis.

In order for the League to be prepared to properly respond to all possible scenarios in the event of a threat from an outside source, it must have a multi-faceted plan of action. The first stage of the plan is economic pressure. The Council of Arab Economic Unity (CAEU) should work in conjunction with other relevant organs of the League and the Organization of Petroleum Exporting Countries (OPEC) to develop strategies of an economic nature, such as sanctions, or the reduction of oil production, that will be employed if the League or a Member State faces an imminent outside threat. There should also be a strategy for the use of military force should the need arise. This strategy can best be devised by the Joint Defense Council. The League should partner with the relevant bodies of the UN before these strategies are finalized to ensure that there is international support for these measures should they ever need to be implemented. New and additional funding should be provided by able Member States of the UN who have a vested interest in ensuring that goods and resources continue to flow through the region.

2. **THE COMING RESOURCE WARS: MITIGATING THE CONFLICT OVER NATURAL AND ECONOMIC RESOURCES**

   Egypt is heartened by the progress that has been made toward the realization of the Millennium Development Goal 7C (halving the proportion of the population without sustainable access to safe drinking water and sanitation) by the Arab Ministerial Council for Water and the Center of Arab Water Security, specifically the adoption of the Arab Water Security Strategy. However, despite these positive steps, there is much work left to be done. Also, when considering this issue, we must remember the myriad water issues facing our Palestinian brethren, including the plundering of aquifers under the West Bank of Palestine by Israel. Ultimately, the international community must recognize that the issue of access to resources will only be resolved when the international community unites behind the Arab world to remove the Zionist occupiers from the sovereign state of

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Palestine. The Arab region is the most arid in the world, and the demand on the limited water supply within the region continues to grow at an alarming rate.

Historically, Member States have been at a disadvantage concerning the resource of water, due, in part, to irresponsible use of this limited resource by colonizing powers. However, the future survival of the Arab region depends upon the immediate response to, and future plans for, the preservation of water. If the League responds and acts properly, the quality of life improves, if not, disaster awaits. Management of water quality, control of water pollution, and environmental protection are major issues that must be addressed in order to ensure a prosperous and sustainable future for the Arab world. Current conditions have led to a major water shortage in many areas of the world, but the developing world is suffering the most. With a population of 80 million people and an annual growth of 1.5 million people per year, it is imperative that Egypt modify its water plan\textsuperscript{42}.

Egypt recognizes the threat that upstream development of the Nile poses to its national security and has made it clear that it will defend its water supply by whatever means necessary. However, diplomacy may yet prevail, as states begin to realize that they must partner with one another in order to achieve common goals. In the past, the main focus of Egypt’s water strategy has been using the Aswan Dam to control the Nile, but Egypt and the League of Arab States are now at a crossroads concerning this issue\textsuperscript{3}. When resources that are necessary to sustain the economies and infrastructures of Member States diminish, plans have to be made to find ways to replace those crucial, un-renewable resources. What steps need to be taken? These types of potential conflict can be averted through the introduction of new and more effective water projects between concerned Member States. The Center of Arab Water Security can assist in the research for and implementation of viable projects.

3. STATE BUILDING AND THE LAS: EXAMINING THE LAS RESPONSE TO RECENT REGIME CHANGES IN ARAB STATES

The recent unrest across the region, specifically the situation in Syria, has led the League into uncharted territory. However, to this point, the League has taken appropriate action concerning the unrest in Syria. It is of the utmost importance that Article 19 of the Arab Charter on Human Rights (the people are the source of authority) be an everyday fact of life for every person residing within a Member state.\textsuperscript{43} While it is also incumbent upon the League to ensure that Article 8 of the League Charter not be infringed upon, the Arab Charter on Human Rights should supersede the rights of the State when the State does not act according to accepted conventions. The recent unrest in Egypt that led to the ouster of Hosni Mubarak is a shining example of how power should be transferred to the people when the government fails to act properly. As democratically elected Egyptian President Mohamed Morsi recently stated to the UN General Assembly, “This revolution established a genuine legitimacy, through the efforts of all Egyptians, inside and outside Egypt and with the Grace of God.”\textsuperscript{44}

\textsuperscript{43} The Arab Charter on Human Rights. The UN Refugee Agency. http://www.unhcr.org/refworld/publisher,LAS,,3ae6b38540,0.html
The recent unrest throughout the region has brought to the forefront questions concerning how the transfer of power from one group to another should be handled. The processes that were undertaken in Egypt are but one example of how this transfer can take place. The development of a broad nation building strategy by the League will help to facilitate a peaceful transfer from one regime to another. A partnership between the League and the UN Peace Building Committee (PBC) will allow the League to make use of the PBC’s experience and expertise in nation building while ensuring that the processes and institutions created are suited to the needs of the Arab people.

To achieve the goal enumerated in Article 30 of the Arab Human Rights Charter, the issue of unemployment, and more specifically youth unemployment, must be addressed. During the Non-Aligned Movement (NAM) in Tehran, President Morsi proposed the establishment of a UN body to deal specifically with the education, employment, and political activity of youth. The youth unemployment issue in the Arab world can be addressed by education and training programs facilitated by the Economic and Social Council of the Arab League. Able and willing Member States who have a desire to see the energy of their youth used in a productive and stabilizing manner should provide funding for the program. Providing employment for Arab youth will serve two purposes. It will give them a means to support themselves and their families, and will increase their sense of belonging and purpose in the Arab world. This will serve to greatly increase stability across the region.

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**POSITION PAPER FOR THE INTERNATIONAL ATOMIC ENERGY AGENCY**

**1. ONE YEAR AFTER FUKUSHIMA: EVALUATING IMPROVEMENTS IN TECHNOLOGICAL SAFEGUARDS TO PROTECT THE GLOBAL POPULATION DURING A DISASTER**

Egypt expresses its sincere gratitude to the IAEA for its close co-operation with member states to broaden the peaceful applications of nuclear energy. In spite of this accomplishment, however, much remains to be done. The IAEA is mandated to further nuclear safety by its statute, which states in Article III.A.1 that the IAEA must “conduct its activities in accordance with the purposes and principles of the United Nations to promote peace and international co-operation.” Therefore, the IAEA must attempt to stop the spread of nuclear weaponry, and to assure that nuclear material are used exclusively for peaceful purposes, especially in the MENA region where decaying political problems, undeclared nuclear powers, and unresolved security issues continue to take place. This is of significant importance because African and Arab regions are facing enormous problems in the search for sustainable energy development such as increasing energy demands due to population, economy growth, energy independence, reduction of reliance on fossil fuel, increasing revenue on fossil fuel exports, and reduction of carbon emissions. Egypt identifies the imperative of the Arab and African worlds to be self-sufficient in generating power to
achieve economic development. Nonetheless, Egypt recognizes the imperative of reducing the harmful effects of ionizing radiation arising from the nuclear energy plants. Thus, it is vital that all member states make it a priority to follow safeguards and standards established by the passage of the Safety of Nuclear Research Reactors.\textsuperscript{45}

Furthermore, Egypt calls upon all member states with the possession of or interested in nuclear facilities to adopt IAEA fundamental safety standards, including those specified in Information Circular 225 (Revision 5) to minimize the probability of any sort of accident or the diversion of fissile material to nuclear weapons. Egypt understands that regulating safety is a national responsibility; however, radiation risks may surpass national borders. Therefore, Egypt will work within the IAEA to promote international cooperation under its statute to enhance safety globally by trading experience such as the incident, and by refining know-hows to control hazards in order to avert accidents, to respond effectively to emergencies and to mitigate any risky consequences. The benefits that African and Arab countries can have as a result of the safe development of nuclear energy are essential to mitigate the increasingly volatile fuel markets and costs that are deterring the economic and social development of the regions.


Egypt applauds the fact that, according the 2012 Millennium Development Goals (MDG) Report, Target 7.C (halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation) was recently achieved.\textsuperscript{46} Even with the great steps that have been made, there remain an estimated 783 million people, approximately 11 percent of the global population, who do not have access to safe drinking water. Furthermore, water access remains very low in Sub-Saharan Africa, which is not currently on track to meet the MDG goal for drinking water by 2015. Egypt recognizes the great potential nuclear energy has for expanding water access to those still without potable water, by utilizing isotopic techniques as well as desalinization. Egypt also understands the need for nuclear technology in locating potable water.

Egypt has experienced the benefits of isotopic techniques in water resource management. Isotopic techniques can be used to rapidly and cost-effectively assess water resources. Egypt, with the IAEA’s Isotope Hydrology Section and a TC Regional Model Project, has already experienced great success using isotopic data to identify and manage deep groundwater sources isolated from the waters of the Nile.\textsuperscript{47} Egypt appreciates the $18.8 million dedicated to TC projects over the past ten years. These projects have helped 63 countries in developing isotope hydrology applications.\textsuperscript{48} Egypt calls for the continued support of the IAEA Water Resources Programme in working towards increased

\textsuperscript{45} GC(44)/RES/14


\textsuperscript{47} “Managing Water Resources – IAEA Technical Co-operation” http://www.iaea.org/Publications/Booklets/TcDevelop/two.html

\textsuperscript{48} Ibid.
technology and the sharing of knowledge for the use of nuclear techniques in water management.

Egypt also recognizes the potential for desalinization of salt water through the use of heat provided by nuclear reactors. According to Table 3 in the IAEA Bulletin Vol. 19, No. 1, a dual-purpose nuclear power plant producing 3750 MWth from two units could produce distilled water at an estimated cost $0.25 per cubic meter. These estimates demonstrate the monetary benefits represented by the use of nuclear heat for desalinization. The continued monetary and technological support of the IAEA is necessary for the further development of nuclear water management techniques, in order to make potable drinking water more widely available in Member States, especially those struggling in African nations. Egypt believes that developing nuclear technologies to help meet the water-based needs of struggling nations requires the attention of world powers. Developed nations must meet their pledge to contribute .7 percent of their gross national products to Official Development Assistance (ODA). This pledge, agreed upon in 1970, has yet to be met by most developed countries. This pledge is acknowledged by the UN as a key factor in meeting many of the MDGs.

3. EXAMINING THE USE OF NUCLEAR ENERGY AS A Viable Alternative to Natural Resources

Egypt thanks the IAEA for its significant efforts in supporting the development of nuclear research and development. In his statement to the 47th General IAEA Conference, Ambassador and Permanent Representative of the Arab Republic of Egypt, H.E. Ramzy Ezzeldin Ramzy, expressed Egypt’s “total agreement with IAEA principles that lead to supporting the concepts of partnership in development and in the implementation of the concept of self-reliance for increasing the sources of revenue for nuclear agencies, with emphasis on projects that provide direct revenue and that benefit an end user.” Egypt has taken the opportunity to direct cooperation with the IAEA on such projects. Egypt emphasizes the continued necessity of creating laboratories to conduct hydrological surveys using radioactive isotopes as well as pursuing radioactivity readings. Such laboratories are leading research that encompasses not only Egypt, but many Arab and African nations.

Egypt recognizes the potential for nuclear development in various fields. In his statement to the 47th General IAEA Conference, Ambassador Ramzy highlighted Egypt’s continued cooperation with the IAEA in radioactive applications including the irradiation of food and medical instruments, the production of medical hydrogen, as well as the development of nuclear and environment monitoring equipment. These nuclear

49 Raisic, Nenad. "Desalinization of Sea Water Using Nuclear Heat." IAEA.
   http://www.iaea.org/About/Policy/GC/GC47/Statements/egypt.pdf
52 Ibid.
technologies are valuable resources that could represent a viable alternative to natural resources, as well as offering new and safer products and procedures.

Egypt has a growing demand for energy and limited natural resources with which to produce energy. Nuclear energy can play an important role in supplying electricity as well as expanding the availability of water resources. Egypt has plans for the redevelopment of the Anshas nuclear reactor located north of Cairo, as is allowed under Article IV of the NPT. Many steps have been taken, through technical cooperation with the IAEA, including the selection and evaluation of sites suitable for nuclear power projects, drafting of nuclear law, and enhancement of the capabilities of the Egyptian regulatory body. Egypt is working in close cooperation with the IAEA in order to insure availability of technical expertise for the process. Recognizing the cooperation expressed by IAEA chief Yukiya Amano in Cairo on June 19, Egypt calls upon the IAEA to provide new and additional resources for the further development of nuclear capabilities and the construction of a nuclear power plant.

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56 "IAEA ready to help Egypt with nuclear programme." [http://www.google.com/hostednews/afp/article/ALeqM5jGXDiP1G9HIUTzOd_CX7fCuX5Vbw](http://www.google.com/hostednews/afp/article/ALeqM5jGXDiP1G9HIUTzOd_CX7fCuX5Vbw)
Influence of Microhabitat on the Abundance of White-Footed Mice (*Peromyscus leucopus*) in Urban Greenways

**Abstract.** Urban greenways in Spartanburg County contain a higher density of white-footed mice (*Peromyscus leucopus*) than rural forests. Previous research has suggested that white-footed mice are abundant in habitat that contains dense vegetation. In this study we sought to quantify the horizontal, canopy, and ground cover of 3 urban greenway sites and 3 rural forest (control) sites in Spartanburg County, SC. We found that horizontal cover is most dense in urban greenways, especially the Chinquapin and Cottonwood Trails. Canopy cover was similar across all sites; however, urban greenways generally had a higher number of small trees and a greater stem density than rural forests.

**Tyler Barzee** is a graduate of Byrnes High School and a junior at Clemson University pursuing a Bachelor's Degree in Biosystems Engineering with an emphasis in Bioprocess Engineering. He conducted small mammal research with Dr. Storm the summer after his freshman year at Clemson. Tyler completed a Research Experience for Undergraduates (REU) program at the University of Florida the next summer, focusing on the analysis of biochar produced by microwave pyrolysis. He plans to attend graduate school in Biological Engineering and then work in either the biofuel engineering field or academia. Tyler's hobbies and interests include studying classical guitar, hiking, attending concerts, and playing racquetball.

**Kasey Holbert** is a junior at Clemson University pursuing a Bachelor’s Degree in Biological Sciences and a Minor in Psychology. She started working with Dr. Storm’s field research team the summer preceding her sophomore year. Kasey has also participated in various Creative Inquiry projects at Clemson. She is passionate about animals and has volunteered at Spartanburg Humane Society and worked at pet-care clinics with Dr. Richard Bell in her free time. She has always been fascinated with the science of medicine and aspires to go to medical school to pursue both research and an MD. Her hobbies include crafting, hiking, road-trips and vegetarian cooking.

**Joshua Johnson** is a senior Biology major at USC Upstate. He started doing research with Dr. Storm in 2010 and then went on to complete 2 National Science Foundation Research Experience (REU) for Undergraduates Fellowships. His first REU was at Johns Hopkins.
Tyler Barzee, Kasey Holbert, Joshua Johnson, Chelsea Kross, and Dr. Jonathan Storm

University, where he studied telomerase, a ribonucleoprotein that repairs the end of chromosomes (the telomere) during DNA replication. He then completed a second REU at the University of California, Berkeley where he conducted research on assembly of the kinetochore, a protein complex that connects DNA to microtubules during cell division. He has also serves as a Supplemental Instruction Leader for Introductory Biology and General Chemistry classes at USC Upstate. Josh plans on attending graduate school in the fall to begin work on a Ph.D. in Cellular and Molecular Biology.

Chelsea Kross graduated from USC Upstate with a B.S. in Biology in the Fall of 2012. She is currently a Master’s student in the Biological Sciences program at Eastern Kentucky. Her undergraduate research experiences started in Dr. Pilgrim’s research lab as a sophomore. By her senior year, Chelsea had received two research assistantships, and presented six research presentations at local, national, and international meetings. In addition, she received the Outstanding Senior in Biology award from the Natural Sciences and Engineering Division. The work presented in this volume resulted from her service as a teaching assistant for Dr. Pilgrim’s Ecology and Evolutionary Biology course during the Fall of 2012. As a Teaching Assistant, Chelsea was able to help undergraduate students learn the process of science and help them understand why research is an integral part of learning biology. She enjoyed the opportunity to teach and learn with the students, and hopes to continue incorporating student learning into future research projects. She thanks Dr. Pilgrim for all the guidance and support she has given and continues to give. “I am very thankful for the time and support provided by the skilled professors at USC Upstate. I look forward to applying what I have learned as an undergraduate to my graduate school experience.”

Dr. Jonathan Storm is an Assistant Professor of Biology at USC Upstate. He earned his Ph.D. from Indiana State University and has published in journals such as the American Naturalist, Journal of Comparative Physiology, Journal of Experimental Biology, Canadian Journal of Zoology, Functional Ecology, and the Journal of Wildlife Management. His research interests include the urban ecology of small mammals and anti-predator behavior. His research on white-nose syndrome in bats was featured on National Public Radio and his cricket anti-predator work has been featured in the New York Times, BBC Wildlife Magazine, and the Discovery Channel Canada. Jon is a native of Iowa who enjoys hiking and nature photography in his spare time.
1. INTRODUCTION

As a result of urban sprawl, wildlife habitat is being turned into disjunct fragments embedded in a human-dominated landscape [1]. One method by which expanding urban areas may preserve wildlife habitat is through the retention and creation of urban greenways. An urban greenway is linear parkland maintained in a more natural condition than typical urban parks. A common example is forested land along rivers within urban areas. Greenways are often multi-use habitats with trails for hiking and other recreational purposes [2]. Although wildlife conservation goals are often stated in greenway retention plans, the actual contribution of urban greenways to wildlife conservation remains unclear [3].

Within forested ecosystems in Spartanburg County, South Carolina, the white-footed mouse (*Peromyscus leucopus*) is the most abundant small mammal; however, its abundance varies both within and between sites [4; Table 1]. White-footed mice tend to occur in habitats containing dense vegetative cover [5-6], likely because these habitats foster a lower risk of predation and have a higher density of invertebrate prey [7].

In this study we sought to (i) characterize the microhabitat of urban greenways and rural forests and (ii) determine which microhabitat features are the best predictors for the occurrence of *P. leucopus*. We hypothesized that the linear, fragmented nature of greenways would lead to a greater density of vegetative cover at urban greenways than at rural forests. We also hypothesized that white-footed mice would be most abundant at sites containing dense vegetative cover.

2. METHODS

We assessed the horizontal, canopy, and ground cover at 3 urban greenways (Chinquapin Trail, Cottonwood Trail, and Palmetto Trail) and 3 rural forests (2 sites within the Pacolet River Heritage Preserve designated as ‘Pacolet South’ and ‘Pacolet North’ and Peter’s Creek Heritage Preserve) in Spartanburg County, South Carolina.

**Measuring Horizontal Cover** – we surveyed 20 randomly selected locations at each site using a 2 m black and white profile board. The proportion of the profile board that was visible from a distance of 15 m was visually estimated and scored such that: 1 = 0-19% visual obstruction, 2 = 20-39% obstruction, 3 = 40-59% obstruction, 4 = 60-79% obstruction, and 5 = 80-100%. We scored the horizontal cover at 4 vertical dimensions: 0-0.5 m, 0.5-1.0, 1.0-1.5, and 1.5-2.0 m above the ground.

**Measuring Canopy Cover** – Canopy cover was assessed using a GRS densitometer at each of the 125 small mammal live trap locations used at each field site as part of a different study. Traps were placed in a 5 x 25 grid at each site with 10 m spacing between traps [4].

**Measuring Ground Cover** – At each of the 125 live trap locations, we counted the number of stems (woody or herbaceous) within a 1 m radius of each trap. We only counted woody stems for shrubs and trees less than 2 m tall. We also visually estimated the percent cover of the following ground cover categories: bare soil, grass, fern, small tree, rock,
downed woody debris, leaf litter, lichen, and moss. We measured leaf litter depth in the 4 cardinal directions at 0.5 m distance from each trap.

We used a MANOVA with a post hoc Tukey HSD to distinguish between the proportions of each ground cover type across sites. To ensure that we only compared cover types that were relatively common, we only distinguished between cover types that constituted at least 5% of mean cover at one or more sites. We performed a Kruskal-Wallis one-way ANOVA with a post hoc Tukey HSD to compare the horizontal cover between sites.

**Capture Rate and Stem Density** – We wished to determine whether white-footed mouse abundance was related to vegetation density at Peter's Creek. We picked this site as it was highly variable in vegetative cover across the site. We used a two sample t-test to compare the total stem density at live trap locations which had a white-footed mouse capture in 2010 or 2011 to the locations which did not have a mouse capture during this time period. All analyses were performed in *Statistica*.

3. **RESULTS AND DISCUSSION**

Ground cover was relatively similar at each site; however, urban greenways tended to have a greater number of small trees and a higher stem density than the control sites (Table 2). Our results could have been influenced by the inherent disturbances in cover from the field crew’s repeated presence at mammal live trapping transects, but this impact was consistent across each site. The difference in ground cover was most pronounced at the Chinquapin and Cottonwood Trails.

We found significant variation in horizontal cover between sites (Kruskal-Wallis ANOVA; H = 70.80; p < 0.001; Fig. 1). The horizontal cover at Cottonwood was significantly greater than the cover at Chinquapin (p = 0.004) as well as the other 4 sites (all p < 0.001). In addition, horizontal cover at Chinquapin was significantly greater than at Pacolet South (p = 0.009). There was a non-significant trend for the horizontal cover at Chinquapin to be higher than at Peter’s Creek (p = 0.055) and for the cover at Pacolet North to be higher than Pacolet South (p = 0.054).

The high stem density and horizontal cover at urban greenways such as Chinquapin and Cottonwood correlates with the high abundance of white-footed mice encountered at these sites. Our results agree with prior studies that have found a positive correlation between white-footed mouse density and dense vegetative cover [5-6]. The stem density and horizontal cover was relatively low at the Peter’s creek site; however, the density of herbaceous and woody stems was highly variable within this site. For example, some areas at this site, such as along Peter’s Creek, contained a high density of greenbrier (*Smilax spp.*). Other areas, however, consisted of open habitat with very little vegetative cover and had a low stem density. During 2010 and 2011, white-footed mice were captured at 33 of the 125 live trapping sites at Peter’s Creek. The total stem density at traps where mice were captured was significantly higher than at traps where mice were not captured (t = 4.29; df = 123; p < 0.001; Fig. 2).
Table 1. Number of white-footed mice (*Peromyscus leucopus*) captured at each study site during 2009-2011. Chinquapin, Pacolet River North, and Pacolet River South were only live trapped in 2011.

<table>
<thead>
<tr>
<th></th>
<th>Urban Greenways</th>
<th></th>
<th>Control Sites</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Chinquapin</td>
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<td>Palmetto</td>
<td>Pacolet</td>
<td>Pacolet</td>
</tr>
<tr>
<td></td>
<td>Trail</td>
<td>Trail</td>
<td>Trail</td>
<td>River South</td>
<td>River North</td>
</tr>
<tr>
<td>2009</td>
<td>--</td>
<td>33</td>
<td>10</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2010</td>
<td>--</td>
<td>28</td>
<td>13</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2011</td>
<td>27</td>
<td>16</td>
<td>18</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Mean</td>
<td>27.0</td>
<td>25.7</td>
<td>13.7</td>
<td>12.0</td>
<td>15.0</td>
</tr>
</tbody>
</table>

Table 2. Mean (± SE) proportion for each ground cover type across study sites. Different letters constitute a significant difference (P < 0.05) between sites using a post-hoc Tukey HSD. Sites were only compared if the variable constituted at least 5% of the mean ground cover at one or more sites.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th>Control Sites</th>
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</thead>
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<tr>
<td></td>
<td>Chinquapin</td>
<td>Cottonwood</td>
<td>Palmetto</td>
<td>Pacolet</td>
<td>Pacolet</td>
</tr>
<tr>
<td></td>
<td>Trail</td>
<td>Trail</td>
<td>Trail</td>
<td>River South</td>
<td>River North</td>
</tr>
<tr>
<td>Bare Soil</td>
<td>2.9 ± 0.8</td>
<td>3.1 ± 0.7</td>
<td>1.2 ± 0.2</td>
<td>1.0 ± 0.2</td>
<td>1.3 ± 0.5</td>
</tr>
<tr>
<td>Grass</td>
<td>0.4 ± 0.2&lt;sup&gt;A&lt;/sup&gt;</td>
<td>45.3 ± 3.5&lt;sup&gt;B&lt;/sup&gt;</td>
<td>0.0 ± 0.0&lt;sup&gt;A&lt;/sup&gt;</td>
<td>9.9 ± 1.3&lt;sup&gt;A&lt;/sup&gt;</td>
<td>27.4 ± 2.8&lt;sup&gt;C&lt;/sup&gt;</td>
</tr>
<tr>
<td>Fern</td>
<td>0.1 ± 0.0</td>
<td>0.4 ± 0.2</td>
<td>0.3 ± 0.1</td>
<td>1.6 ± 0.3</td>
<td>3.1 ± 0.5</td>
</tr>
<tr>
<td>Small Tree</td>
<td>23.6 ± 1.8&lt;sup&gt;A&lt;/sup&gt;</td>
<td>20.0 ± 2.0&lt;sup&gt;A&lt;/sup&gt;</td>
<td>19.4 ± 1.3&lt;sup&gt;A&lt;/sup&gt;</td>
<td>8.1 ± 0.6&lt;sup&gt;B&lt;/sup&gt;</td>
<td>7.3 ± 0.6&lt;sup&gt;B&lt;/sup&gt;</td>
</tr>
<tr>
<td>Rock</td>
<td>0.1 ± 0.1</td>
<td>0.0 ± 0.0</td>
<td>0.1 ± 0.1</td>
<td>0.1 ± 0.0</td>
<td>0.1 ± 0.0</td>
</tr>
<tr>
<td>DWD</td>
<td>6.6 ± 0.5&lt;sup&gt;A&lt;/sup&gt;</td>
<td>8.9 ± 0.9&lt;sup&gt;A&lt;/sup&gt;</td>
<td>14.2 ± 1.0&lt;sup&gt;B&lt;/sup&gt;</td>
<td>7.0 ± 0.6&lt;sup&gt;A&lt;/sup&gt;</td>
<td>6.5 ± 0.7&lt;sup&gt;A&lt;/sup&gt;</td>
</tr>
<tr>
<td>Leaf Litter</td>
<td>66.2 ± 1.9&lt;sup&gt;A&lt;/sup&gt;</td>
<td>22.4 ± 2.1&lt;sup&gt;B&lt;/sup&gt;</td>
<td>64.4 ± 1.5&lt;sup&gt;A&lt;/sup&gt;</td>
<td>72.1 ± 1.5&lt;sup&gt;A&lt;/sup&gt;</td>
<td>53.6 ± 2.5&lt;sup&gt;C&lt;/sup&gt;</td>
</tr>
<tr>
<td>Lichen</td>
<td>0.0 ± 0.0</td>
<td>0.0 ± 0.0</td>
<td>0.0 ± 0.0</td>
<td>0.0 ± 0.0</td>
<td>0.1 ± 0.0</td>
</tr>
<tr>
<td>Moss</td>
<td>0.1 ± 0.0</td>
<td>0.0 ± 0.0</td>
<td>0.3 ± 0.1</td>
<td>0.3 ± 0.1</td>
<td>0.7 ± 0.2</td>
</tr>
<tr>
<td>Stem Density</td>
<td>43.6 ± 3.1&lt;sup&gt;A&lt;/sup&gt;</td>
<td>34.1 ± 2.7&lt;sup&gt;B&lt;/sup&gt;</td>
<td>13.1 ± 0.9&lt;sup&gt;C&lt;/sup&gt;</td>
<td>3.6 ± 0.3&lt;sup&gt;C&lt;/sup&gt;</td>
<td>7.2 ± 0.6&lt;sup&gt;C&lt;/sup&gt;</td>
</tr>
<tr>
<td>Canopy Cover</td>
<td>72.0</td>
<td>68.8</td>
<td>65.6</td>
<td>70.4</td>
<td>72.0</td>
</tr>
</tbody>
</table>
Figure 1. Mean horizontal cover index score across all 4 vegetation heights at 3 urban greenways (Chinquapin, Cottonwood, and Palmetto) and 3 rural forests (Pacolet River South, Pacolet River North, and Peter’s Creek) in Spartanburg County. Error bars represent 95% confidence intervals.

Figure 2. Mean (± SE) total stem density surrounding live traps at Peter’s Creek during 2010 and 2011. Live traps which captured a white-footed mouse were within habitat having a significantly higher stem density than traps which did not capture a mouse (t = 4.29; df = 123; p < 0.001).
4. CONCLUSIONS

Urban greenways in Spartanburg, South Carolina tend to have a higher density of stems and small trees. In addition, the horizontal vegetation cover is greater at greenways than at rural forests. Given the preference of white-footed mice for dense, brushy habitat, it is not surprising that white-footed tend to be more abundant at urban greenways than rural forests. In addition, we found that within one of our rural forests, Peter’s Creek, white-footed mice were most abundant in areas with a high density of stems.

ACKNOWLEDGEMENTS

We thank the USC Upstate Teaching and Productive Scholarship committee and the Center for Undergraduate Research and Scholarship for funding the small mammal mark-recapture research. We also thank the small mammal field crews for collecting the mark-recapture data on white-footed mice.

REFERENCES

ABSTRACT. Small mammals living in urban greenways may face a greater risk of predation than individuals within rural forests. This increased predation risk often stems from non-native predators such as domestic cats (*Felis catus*). Our previous research on small mammal communities in Spartanburg County suggests that white-footed mice (*Peromyscus leucopus*) within urban greenways have a lower survival rate than mice in rural forests. In this study we sought to quantify the relative abundance and species richness of mammalian predators within urban greenways and compare it to rural forests. We found that urban greenways and rural forests have similar communities of predatory mammals. In addition, domestic cats were not encountered at any of our study sites. Our research suggests small mammals in urban greenways likely face a risk of predation similar to that of mice in rural forests. Furthermore, domestic cats are likely not a major predator of small mammals within either urban greenways or rural forests in Spartanburg County.

_Elliott Gibbs_ is a senior biology major at USC upstate. He began mammalian predator work with Dr. Storm his sophomore year. He won the “Best Poster in the Natural Sciences” at the 2012 Upstate Research Showcase for his predator research. He received a Magellan’s Scholar grant for amphibian work with Dr. Pilgrim the summer of his junior year, and continues to work on this project. Elliott also serves as a supplemental instructor for Introductory Biology courses at Upstate. As a supplemental instructor, he helps freshman biology majors adjust to the rigors of college science courses and tutors them on Introductory Biology content. He also volunteers for the North American Amphibian Monitoring Program, which conducts vocalization surveys of frogs to document species diversity within the Upstate of South Carolina.

_Chelsea Kross_ graduated from USC Upstate with a B.S. in Biology in the Fall of 2012. She is currently a Master’s student in the Biological Sciences at Eastern Kentucky. Her undergraduate research experiences started in Dr. Pilgrim’s research lab as a sophomore. By her senior year, Chelsea had received two research assistantships, and presented six research presentations at local, national, and international meetings. In addition, she received the Outstanding Senior in Biology award from the Natural Sciences and Engineering Division. The work presented in this volume
resulted from her service as a teaching assistant for Dr. Pilgrim’s Ecology and Evolutionary Biology course during the Fall of 2012. As a Teaching Assistant, Chelsea was able to help undergraduate students learn the process of science and help them understand why research is an integral part of learning biology. She enjoyed the opportunity to teach and learn with the students, and hopes to continue incorporating student learning into future research projects. She thanks Dr. Pilgrim for all the guidance and support she has given and continues to give. "I am very thankful for the time and support provided by the skilled professors at USC Upstate. I look forward to applying what I have learned as an undergraduate to my graduate school experience.”

**ANDI DONAHUE** is a graduate of the University of South Carolina Upstate with a Bachelors of Science in Biology. She volunteered with the North American Amphibian Monitoring Program from 2009-2012, helping to monitor the species diversity of calling frogs and toads in the Upstate region of South Carolina. Andi conducted predator surveys with Dr. Storm during the summer of 2011. Andi plans on attending graduate school to begin work on a Master’s degree in Wildlife Biology. She enjoys spending time in nature, particularly bird watching, in her spare time. She hopes to obtain a career working for the International Union for Conservation of Nature.

**DR. JONATHAN STORM** is an Assistant Professor of Biology at USC Upstate. He earned his Ph.D. from Indiana State University and has published in journals such as the American Naturalist, Journal of Comparative Physiology, Journal of Experimental Biology, Canadian Journal of Zoology, Functional Ecology, and the Journal of Wildlife Management. His research interests include the urban ecology of small mammals and anti-predator behavior. His research on white-nose syndrome in bats was featured on National Public Radio and his cricket anti-predator work has been featured in the New York Times, BBC Wildlife Magazine, and the Discovery Channel Canada. Jon is a native of Iowa who enjoys hiking and nature photography in his spare time.

**1. INTRODUCTION**

Urbanization is a major factor influencing the loss of biodiversity, as it removes natural habitat and increases fragmentation of the landscape [1] – [2]. Greenways are one method by which natural habitat can be preserved within urban landscapes [3]. An urban greenway is linear parkland maintained in a more natural condition than typical urban parks. A common example is forested land along urban streams and rivers. In addition to their wildlife conservation value, urban greenways also aid in flood control and provide recreational opportunities [4]. Previous research at urban greenways in Spartanburg, South Carolina shows that white-footed mice (*Peromyscus leucopus*) have a lower survival
rate within urban greenways than at rural forests [5]. Non-native predators such as domestic cats (*Felis catus*) can be abundant within urban habitats and their presence may lead to reduced survival for native wildlife [2], [6] – [7]. In addition, feral cats have been shown to be a major predator of small mammals, including white-footed mice in Virginia [6]. If urban greenways contain a greater density of carnivorous mammals, this could explain the heightened mortality rate of white-footed mice in urban greenways [5]. In this study, we sought to document the relative abundance of domestic cats and other predators of small mammals within urban greenways in Spartanburg, South Carolina. We compared the abundance of these predators within urban greenways to that in rural forests in Spartanburg County.

2. Methods

We used non-invasive survey techniques to document the occurrence of carnivorous mammals at 3 urban greenways (Upper Chinquapin Trail, Cottonwood Trail, and the USC Upstate Palmetto Trail) and 3 rural forests (two sites at the Pacolet River Heritage Preserve, and Peter’s Creek Heritage Preserve) in Spartanburg County, South Carolina.

We placed one passive, infrared, motion-activated wildlife camera at each site. Each camera was mounted to a tree at approximately 2 m height. At a distance of 3-5 m in front of the camera, we placed one frozen chicken thigh within a metal suet feeder. The feeder was strapped to a tree trunk at a height of 2 m using bungee cords. We also smeared approximately 1 teaspoon of a commercial skunk-scented carnivore lure (Caven’s Gusto) onto a tree branch near the chicken bait. All cameras were set to record 10 seconds of video when an animal walked in front of the infrared beam. Cameras recorded the date and time when triggered.

At each site we also deployed two soot-covered track plates (90 cm x 25 cm). Track plates were placed at the end of linear transects running 120 m in either the east/west or north/south direction from the camera station. Each end of the aluminum track plate was coated with black copy machine toner. A 20 cm wide section of contact paper, sticky side facing up, was then placed in the middle of the plate to collect prints. The track plate was set within an enclosure of Coroplast to provide shelter from precipitation. Carnivores were lured onto the track plate using 2 mL of a 1:1 mixture of salmon oil and mink gland extract. This mixture was placed on a cotton ball and secured within an envelope of metal mesh strapped to the roof of the enclosure, directly above the contact paper.

During June of 2011, we surveyed the Upper Chinquapin, Pacolet River East, and Pacolet River West sites for 12 continuous days. We surveyed the Cottonwood Trail, Palmetto Trail and Peter’s Creek sites for 12 days during July of 2011. Each site was monitored for an additional 15 days during November – December of 2011. Trail cameras and track plates were checked every 3 days during the survey period and the bait or lure was replaced during each visit. Our research followed guidelines established by the American Society of Mammalogists [8].

3. Results and Discussion

Using trail cameras, we detected a total of 4 carnivore species at urban greenways and 3 species at rural forests (Table 1). Raccoons (*Procyon lotor*) were the most common
predator at both greenways and rural forests. Although they were rare (only a single detection of each), coyotes (*Canis latrans*) and gray foxes (*Urocyon cinereoargenteus*) were only encountered within urban greenways. Domestic dogs (*Canis familiaris*) were encountered at 2 of the rural forest sites.

**Table 1.** Number of independent detection events for mammals using trail cameras at each study site.

<table>
<thead>
<tr>
<th>Species</th>
<th>Urban Greenways</th>
<th>Control Sites</th>
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<tbody>
<tr>
<td></td>
<td>Chinquapin Trail</td>
<td>Cottonwood Trail</td>
</tr>
<tr>
<td>Raccoon</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Gray Fox</td>
<td>2</td>
<td>--</td>
</tr>
<tr>
<td>Virginia Opossum</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Coyote</td>
<td>2</td>
<td>--</td>
</tr>
<tr>
<td>Domestic Dog</td>
<td>2</td>
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</tbody>
</table>

**Table 2.** Number of detection events for species encountered using sooted track plates at each site.

<table>
<thead>
<tr>
<th>Species</th>
<th>Urban Greenways</th>
<th>Control Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
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<td>3</td>
<td>1</td>
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<tr>
<td>Gray Fox</td>
<td>2</td>
<td>--</td>
</tr>
<tr>
<td>Virginia Opossum</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Striped Skunk</td>
<td>2</td>
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</table>
Similar to the trail cameras, data from sooted track plates suggest that raccoons and opossums are the most common mammalian predators at both urban greenways and rural forests (Table 2). Although we did not detect striped skunks (*Mephitis mephitis*) using wildlife cameras, there were 2 detections using sooted track plates. This highlights the value of using multiple sampling techniques to effectively survey the community of mammalian predators within a forest [9]. We detected raccoons and opossums at more sites with track plates than with cameras (Table 1 and Table 2). This is similar to the results of [9] who found that in Virginia, track plates were more effective for detecting raccoons and opossums than wildlife cameras.

### 4. Conclusions

Our preliminary results suggest that white-footed mice likely face a similar assemblage of mammalian predators within urban greenways and rural forests. We documented a similar assemblage of species using wildlife cameras and sooted track plates; however, wildlife cameras detected some species (e.g. a coyote and domestic dogs, *Canis familiaris*) that are too large to enter the track plate enclosure. Our results were consistent with other carnivore surveys [9], but our sample size is considerably smaller and our results should be viewed as a preliminary. Although domestic cats are common in some urban greenways, we found no evidence of cats using either wildlife cameras or sooted track plates. Thus, we suspect that domestic cats may be rare within urban greenways in Spartanburg and likely do not pose a major threat to small mammals. Given the small number of predatory mammals encountered at each site, more data are needed to properly evaluate the prevalence of carnivores within urban greenways.

### Acknowledgements

We thank the Division of Natural Sciences and Engineering for funding this research.

### References


ABSTRACT. Previous research indicates that college students who have had higher prior exposure to persons with physical disabilities also report greater acceptance. The present study examined whether these findings extend to students’ willingness to form personal friendships with individuals described as having either a physical disability or a psychological disorder. A 2 (type of disability) x 2 (visibility of symptoms) x 3 (level of prior exposure) factorial design using a scenario methodology found main effects for level of prior exposure on the general and school-related measures (but not on the friendship-related items) and main effects for type of disability across most measures (including the friendship-related items). These results indicate that participants who had greater prior exposure or experience with persons with any type of disability were more willing to interact in a general and school-related context with our hypothetical individuals, but were not more willing to form close personal friendships. It appears that something more than just having known someone with some type of disability or disorder is needed to encourage this next step. The second finding indicated that, in all contexts, participants made more favorable ratings toward individuals described as having physical disabilities versus psychological disorders; demonstrating a greater stigma associated with psychological disorders. It appears that, while laws such as the ADA mandate that colleges provide accommodations for educational access, strides still need to be made to afford students with disabilities (particularly those related to mental health) social access and acceptance.

KATHERINE HOWELLS is currently a first year law student at New England Law | Boston in Boston, Massachusetts. She graduated from USC Upstate in May 2012 with a Bachelor of Science in Experimental Psychology. At USC Upstate, she became interested in research opportunities and began working on several projects under the supervision of Drs. Keen, Griffin, and Lehman. Her research focused on how attire and demeanor can influence perceptions as well as the social acceptance and perception of individuals with disabilities. As a senior she presented a poster of her research at the Upstate SC Research Symposium held at Milliken & Company in Spartanburg, SC. Outside of school, Katherine enjoys working out, exploring Boston, and listening to music. “I am very grateful for the experience of working with these professors and excited to use what I learned in psychology and how it will assist me in my future career in law.”

DR. KIM PURDY is an Associate Professor of Psychology. She earned a degree in Experimental Psychology from Queen’s University in Kingston, Ontario, Canada. Dr. Purdy currently teaches courses on Sensation and Perception, Cognitive Neuropsychology and Human Communication. Her research is in the area of attention. Active research projects in Dr. Purdy’s lab include metacognitive demands of interpreting, the cognitive benefit of expert performance in interpreting tasks, and an investigation into automatic and controlled processes that impact the availability of cognitive resources during instances of craving. Dr. Purdy has published articles in the Canadian Journal of
Experimental Psychology, the Journal of Experimental Psychology: Human Perception and Performance, and the Proceedings of the ASME International Mechanical Engineering Congress: Dynamic Systems and Control Division. Dr. Purdy believes that one of the strengths of the psychology program at USC Upstate is the opportunity for undergraduate research experiences. Dr. Purdy works with several research students each year, teaching and mentoring them so that they may present their research at undergraduate conferences.

**DR. STEFANIE KEEN** is an Assistant Professor of Psychology. She earned a Ph.D. in Clinical Psychology from Indiana University. Dr. Keen currently teaches a variety of undergraduate courses including Child Abuse and Neglect, Developmental Psychology, and Abnormal Psychology. She is also engaged in an active research program related to the psychological effects of traumatic stress including intimate partner violence and child maltreatment, and has published articles in Clinical Psychology Review and the Journal of Rehabilitation Research and Development and a book titled Child Abuse and Neglect. Dr. Keen enjoys spending time with her family, including her two young daughters – “I’m often horrified by what young children are forced to suffer, and amazed by their resilience.”

**DR. LEIGH LEHMAN** is an adjunct faculty member in the Department of Psychology. She earned a Ph.D. in Rehabilitation Science from the University of Florida. Dr. Lehman currently teaches Psychological Statistics and University 101. Her research interests relate to assessment development and validation, views of students with disabilities, and fear of pain. She has published articles in the Journal of Hand Therapy, American Journal of Occupational Therapy, and Disability and Rehabilitation. Dr. Lehman enjoys spending time with her family, exercising, and being outdoors. “As a former student at USC Upstate, I have so many people, including many here at Upstate, to thank for helping me along my journey as a student. I hope to be able to do the same for those who I now teach.”

**DR. JAN GRIFFIN** is a Professor of Psychology at USC Upstate with more than 30 years’ experience working with undergraduate students on independent research projects. Her interests focus around the effects of social stigma in today’s society. Over the years, she and her students have presented research on such timely topics as attitudes toward dual-working couples, recognition of characteristics that lead to school violence after Columbine, fairness of providing accommodations for individuals with ADHD after the introduction of the ADA Act, missing depression in the elderly as the population ages, the unintended effects of the “No Child Left Behind” Act, potential fallout from taking Family Medical Leave Act (FMLA) leave at work, prejudice towards Arab-Americans after 9-11, and most recently, social acceptance of individuals with disabilities on college campuses. She collaborates widely with colleagues, and their research often is recognized for its excellence at conferences and presentations. “Our
student talent at USC Upstate continues to amaze me. At whatever venue they present their research, from the nationally acclaimed, Posters-on-the-Hill in DC, to the more local Upstate Research Symposium, psychology students from Upstate excel.” Her most recent collaborators are Drs. Stefanie Keen and Leigh Lehman.

1. INTRODUCTION

The number of students with disabilities on college campuses has tripled over the past 20 years [1]. Physical and academic accommodations have been made by universities to allow individuals with disabilities greater access to higher education, however, social acceptance cannot be achieved through institutional accommodations alone. Research suggests that prior exposure to persons with disabilities can positively affect attitudes of acceptance [2]. However, the question remains, is increased prior exposure to individuals with disabilities enough to “bridge the gap” from acquaintance to friendship between those with disabilities and those without? The current study was a replication and extension of a previous vignette study [3], which found that compared to participants who reported lower levels of exposure, those reporting higher levels of prior exposure were more willing to communicate with hypothetical classmates who were described as having physical disabilities. From this initial study it appeared that participants with increased prior exposure to those with disabilities recognized that having a physical disability did not define a person’s character.

For the present study, we investigated the same two physical disabilities as in the previous study and added two psychological disorders. The disorders were chosen because they represent conditions for which symptoms are either obvious (i.e., cerebral palsy and Asperger’s) or subtle (i.e., deafness and depression) to determine whether visibility of symptoms influences level of acceptance. We retained the original measures, assessing general (e.g., communicate in private) and school-related (e.g., ask question about class) items. Additionally, we included several “friendship” items (i.e., ask to lunch, exchange phone numbers, ask to “friend” on Facebook) as more sensitive measures of participants’ willingness to initiate a more in-depth and personal relationship outside of class. Finally, we refined our assessment of prior exposure to include a third, moderate level of prior contact to persons with disabilities. Thus, in the current study, we extended our investigation to determine whether the benefit of a higher level of prior contact with persons with disabilities applies to both physical and psychological disorders and/or to one’s willingness to form more meaningful relationships.

2. METHODS

We used a 2 (type of disability: physical or psychological) x 2 (visibility of symptoms: high and low) x 3 (level of prior exposure: high, moderate, or low) factorial design. Type of disability and level of exposure were between-subjects variables and symptom visibility was a within-subjects variable. Participants (240 psychology students) each read two vignettes presented in a standard order (i.e., obvious, subtle), followed by a brief description of each disability/disorder.
Vignettes describing psychological disorders

Caroline is 20 years old and has Asperger’s syndrome*. She just moved to Spartanburg and is enrolling at USC Upstate for the fall semester. She is very friendly and likes to meet new people, but she often experiences trouble with the right things to say in social situations. Caroline is very intelligent and excels academically, but may have difficulty working well with others because she has a hard time picking up on social cues. She loves to read about her interests but tends to be overly focused on these topics during conversations with others. Change in routine is hard for her to handle. Her disability is very obvious to others.

*Asperger's Syndrome- an autism spectrum disorder that is characterized by significant difficulties in social interaction, along with restricted and repetitive patterns of behavior and interests.

Rachel is 20 years old and has depressive disorder*. She just moved to Spartanburg and is enrolling at USC Upstate for the fall semester. She is nice and loves to read. She often experiences feelings of sadness or anxiety; however, she can mask these emotions for short periods of time. Rachel is very friendly, but her sadness sometimes interferes with her meeting new people. She experiences insomnia and restlessness, which causes her to become irritable at times. Although intelligent, she finds it difficult to become motivated to do her work. Her disability is not very obvious to others.

*Depression- (Major Depressive Disorder- MDD) a mental disorder characterized by an all-encompassing low mood accompanied by low self-esteem, and by loss of interest or pleasure in normally enjoyable activities.

Vignettes describing physical disabilities

Caroline is 20 years old and has cerebral palsy*. She just moved to Spartanburg and is enrolling at USC Upstate for the fall semester. She is very friendly and likes to meet new people. Her disability makes it hard for her to walk. She has to drag her left foot, making it difficult to get anywhere quickly. She also has very poor muscle coordination when doing voluntary movements, such as picking things up. Caroline is intelligent and excels academically. She also loves to read, yet sometimes has difficulty with it due to muscle spasms. Her disability is very obvious to others.

*Cerebral Palsy- a motor conditions that cause physical disability in human development, chiefly in the various areas of body movement.

Rachel is 20 years old and is deaf*. She just moved to Spartanburg and is enrolling at USC Upstate for the fall semester. She loves to read and is very nice. She is intelligent, but in class has to sit near the instructor in order to lip read. When more than one person is talking at a time she can become confused. She has on and off ringing in her ears, which can make it hard for her to concentrate and she needs for people to repeat themselves. Others don’t immediately know she is deaf though they
may notice pronunciation errors when she is speaking. Rachel is very friendly, but sometimes is apprehensive to interact with others because of her difficulty hearing. Her disability is not very obvious to others.

*Deafness* - a condition wherein the sufferer's ability to detect certain frequencies of sound is completely or partially impaired.

After reading each vignette, participants completed 20 ratings in which they indicated their likelihood/willingness for interaction with each hypothetical student on 8-point Likert-type scales, where “1” indicated very unlikely/unwilling and “8” indicated very likely/willing. The questions ranged from measuring the likelihood of interacting with the potential classmate in a general way (e.g., “How likely would you be to interact with Caroline?”) or in a school-related setting (e.g., “How likely would you be to do homework with Caroline?”) to initiating a friendship relationship with the potential classmate (e.g., “How likely would you be to ask Caroline to lunch or some other social get together?”). At the end of the questionnaire participants completed a demographic assessment and indicated their level of prior exposure to individuals with disabilities. Prior exposure was assessed on a 9-point scale where “1” indicated no previous contact with persons with any type of disability, “5” indicated have had a friend or classmate with a disability, and “9” indicated lived with someone with any type of disability. As can be seen in Table 1, 70 participants indicated low prior exposure, 108 participants indicated moderate prior exposure, and 62 participants indicated high prior exposure.

<table>
<thead>
<tr>
<th>Table 1. Level of Prior Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOW</strong></td>
</tr>
<tr>
<td>No previous contact with persons with any type of disability</td>
</tr>
<tr>
<td>Ratings 1-3</td>
</tr>
<tr>
<td>70 Participants</td>
</tr>
</tbody>
</table>

### 3. RESULTS

Separate 2 x 2 x 3 analyses of variance were conducted on each dependent measure. In order to report a conservative estimate of our results, a modified Bonferroni approach was used and only results that reached p < .01 were reported. Results revealed main effects for level of prior exposure on only the general and school-related items. As can be seen in Figure 1, the main effects for prior exposure indicated that, compared to participants with moderate or low levels of exposure, those with high prior exposure to persons with any type of disability indicated more positive attitudes toward our fictitious individuals. However, the positive effect of high prior exposure did not extend to the initiating
friendship items; there were no significant differences among the three exposure groups on any of these measures.

Figure 1. Main effects for level of prior exposure on general and school-related items.

The results also revealed main effects for type of disability on all categories of dependent measures. As can be seen in Table 2, on the general, school, and friendship-related items, participants made more favorable ratings toward individuals described as having physical disabilities versus psychological disorders. Furthermore, symptom visibility did not impact these ratings; the stigma toward psychological disorders was equally present for both the visible and hidden psychological symptoms.
Table 2. Main Effect for Type of Disability

<table>
<thead>
<tr>
<th>Type of Disability</th>
<th>F-value</th>
<th>p-value</th>
<th>GENERAL ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td>6.61</td>
<td>16.86</td>
<td>How willing would you be to interact with Caroline?</td>
</tr>
<tr>
<td>Psychological</td>
<td>5.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>4.71</td>
<td>6.99</td>
<td>How willing would you be to ask Caroline about her disability?</td>
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<tr>
<td>Psychological</td>
<td>3.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>6.93</td>
<td>15.92</td>
<td>Would be patient when communicating with Caroline?</td>
</tr>
<tr>
<td>Psychological</td>
<td>6.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>6.74</td>
<td>14.391</td>
<td>Would you be comfortable around Caroline in a public setting?</td>
</tr>
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<td>6.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical</th>
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<th>F-value</th>
<th>p-value</th>
<th>SCHOOL-RELATED ITEMS</th>
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<tbody>
<tr>
<td>Physical</td>
<td>5.35</td>
<td>28.96</td>
<td>.000</td>
<td>How comfortable would you be to share a dorm room/apartment with Caroline (Assume same sex)?</td>
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<tr>
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<td></td>
<td></td>
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<tr>
<td>Physical</td>
<td>6.47</td>
<td>8.41</td>
<td>.004</td>
<td>How likely would you be to ask Caroline a question about class?</td>
</tr>
<tr>
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<td>5.76</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
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<td>10.73</td>
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<td>How likely would you be to do homework with Caroline?</td>
</tr>
<tr>
<td>Psychological</td>
<td>5.45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>6.37</td>
<td>13.03</td>
<td>.000</td>
<td>If you were setting up a study group, how likely would you be to ask Caroline to join?</td>
</tr>
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<td>5.51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>6.58</td>
<td>20.54</td>
<td>.000</td>
<td>How willing would you be to work on a class project with Caroline?</td>
</tr>
<tr>
<td>Psychological</td>
<td>5.53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
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<td>22.62</td>
<td>.000</td>
<td>How willing would you be to take another class with Caroline?</td>
</tr>
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<td>5.58</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>6.12</td>
<td>18.47</td>
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<td>How comfortable would you be to become friends with Caroline outside of school?</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
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<td>10.04</td>
<td>.002</td>
<td>How likely would you be to continue interaction with Caroline after the semester has ended?</td>
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<td>4.57</td>
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<table>
<thead>
<tr>
<th>Physical</th>
<th>Psychological</th>
<th>F-value</th>
<th>p-value</th>
<th>FRIENDSHIP-RELATED ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td>5.49</td>
<td>9.60</td>
<td>.002</td>
<td>How likely would you be to ask Caroline to lunch or some other social get together?</td>
</tr>
<tr>
<td>Psychological</td>
<td>4.69</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>5.85</td>
<td>12.99</td>
<td>.000</td>
<td>How likely is it that you would exchange phone numbers with Caroline?</td>
</tr>
<tr>
<td>Psychological</td>
<td>4.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>6.72</td>
<td>16.77</td>
<td>.000</td>
<td>How likely is it that you would request that Caroline be your friend on Facebook?</td>
</tr>
<tr>
<td>Psychological</td>
<td>5.67</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. CONCLUSION

As expected, there was a main effect for prior exposure. Having previously had a high level of exposure to someone with either a physical disability or a psychological disorder correlated with higher levels of comfort in both general and school-related contexts. The results replicated the previous study and indicated that the prior exposure effect extended to psychological disorders as well. However, our results also showed that the positive effects for prior exposure did not extend to more in-depth personal relationships. Participants who had lived with someone with a physical disability or a psychological disorder indicated that they were no more likely to ask a fellow student to lunch, exchange phone numbers, or become Facebook friends than participants who reported no prior contact. Further, on the more sensitive, “first-step-to-friendship” items, participant responses were lower than for the general and school-related items. Having had higher levels of prior exposure did not make a difference in participants’ willingness to form more meaningful friendships with our hypothetical individuals. Perhaps something beyond mere exposure is required to make that leap from acceptance to friendship.

The main effect for type of disability was consistent with previous findings, clearly demonstrating a stigma associated with having a psychological disorder. Overall, our participants tended to express less comfort toward a peer described as having a psychological versus a physical problem. The stigma toward psychological disorders is not new [4], but it may be of particular importance on college campuses, especially as recent reports estimate that nearly 30% of college students nationwide indicate experiencing depressive symptoms [5]. College campuses do provide support for such problems, but, perhaps, not enough.

The barrier to acceptance remains for both physical disabilities and psychological disorders. One area for future research would be to identify specific factors that would help cross this barrier in educational, occupational, and social settings. It is important for those in administrative roles to be aware of the more subtle obstacles faced by individuals with disabilities and psychological disorders and to recognize the potential role that prior exposure may play in helping to alleviate those obstacles. All too often, disability and mental health awareness programs focus on superficial factors related to acceptance, whereas more in-depth programming activities are likely necessary to effect substantive change.

REFERENCES


BLENDING TEACHING AND RESEARCH IN THE ECOLOGY LABORATORY: THE BIOLOGY OF ANTLIONS AS A CASE STUDY

**ABSTRACT.** As a laboratory exercise in USC Upstate’s Ecology and Evolutionary Biology course, we conducted a field study investigating antlion larvae and their prey in the wild. Specifically, we used linear regression analysis to test the hypotheses that (1) the size of a pit trap is dependent on the size of the antlion that constructed it and (2) the ability of ants to escape from antlion pit traps is dependent on the size of the pit traps. Data we collected supported our hypotheses; in each case, the variables were positively associated and the relationship was mathematically significant (p-values < 0.05). However, the $r^2$ values were low, indicating that the predictive nature of each relationship was weak. In each case, less than 50% of the variation in the dependent variable was explained by variation in the independent variable. From an ecological standpoint, this indicated that other factors impact both the size of pit traps and the likelihood that ants will escape from pit traps. Our laboratory exercise represents one example of a hypothesis-driven field study that engaged students as active researchers and demonstrated the role of biostatistics in ecological investigations.

**CHELSEA KROSS** graduated from USC Upstate with a B.S. in Biology in the Fall of 2012. She is currently a Master’s student in the Biological Sciences at Eastern Kentucky. Her undergraduate research experiences started in Dr. Pilgrim’s research lab as a sophomore. By her senior year, Chelsea had received two research assistantships, and presented six research presentations at local, national, and international meetings. In addition, she received the Outstanding Senior in Biology award from the Natural Sciences and Engineering Division. The work presented in this volume resulted from her service as a teaching assistant for Dr. Pilgrim’s Ecology and Evolutionary Biology course during the Fall of 2012. As a Teaching Assistant, Chelsea was able to help undergraduate students learn the process of science and help them understand why research is an integral part of learning biology. She enjoyed the opportunity to teach and learn with the students, and hopes to continue incorporating student learning into future research projects. She thanks Dr. Pilgrim for all the guidance and support she has given and continues to give. “I am very thankful for the time and support provided by the skilled professors at USC Upstate. I look forward to applying what I have learned as an undergraduate to my graduate school experience.”

**DR. MELISSA PILGRIM** is Director of Research and an Associate Professor of Biology at USC Upstate. She joined the faculty at USC Upstate in the Fall of 2006. Her primary research focus involves an integrative
approach to investigating how ecosystems respond to environmental change (natural and anthropogenic). Her research program integrates field ecology, biogeochemistry (e.g., stable isotopes), and ecophysiology. She earned her Ph.D. from the University of Arkansas in 2005 and transitioned to a post-doctoral research position at the University of Georgia’s Savannah River Ecology Laboratory (SREL). Many of her current research initiatives still involve collaborations with SREL faculty and students. In addition, she has an army of undergraduate students working with her in an undergraduate research group called Upstate Herpetology. Her publications range from book chapters in Herpetology volumes to scholarly articles in isotope, ecological, and herpetological journals. She currently serves on the Editorial Board for Herpetologica, as Book Review Editor for the Association of Southeastern Biologists, and as the Upstate Regional Coordinator for the North American Amphibian Monitoring Program. Her hobbies include kayaking, hiking, yoga, gardening and cooking.

1. INTRODUCTION

Antlions (genus *Myrmeleon*) are predatory insects that live in areas with sandy soil. Like many insects, antlions have a larval form and a winged adult form. Antlions are considered holometabolous insects, since their transformation from the larval stage to the adult stage is a complete metamorphosis [1]. The larvae feed on ground-dwelling insects by constructing pit traps [2]. Ants fall into the funnel-shaped pit traps, often sliding to their death. The larval antlion has large jaws that it uses to kill the ants. If an ant escapes the antlion’s initial attack and tries to climb up the pit wall the antlion often responds by throwing sand at the ant [3]. Throwing sand starts avalanches that often carry the prey back to the bottom of the pit and into the waiting predator’s jaws. The larvae grow, and make a cocoon, and then the antlions metamorphose (like a caterpillar changing into a butterfly) into the winged adults. These adults mate and then the females lay their eggs in the sand to start a new generation.

Antlions in their larval stage make great target organisms for field studies, as their pit traps make them obvious to find in nature and they are easy to capture from their pit traps. As a laboratory exercise in USC Upstate’s Ecology and Evolutionary Biology course, we conducted a field study investigating antlion larvae and their prey in the wild. We collected data and used a form of statistical analysis known as linear regression to evaluate the data. In regression analysis, one variable (the independent variable) is used to predict the value of a second variable (the dependent variable). In linear regression it is assumed that the relationship between the two variables can be expressed in a straight line: \( y = m(x) + b \), where \( y \) is the value of the dependent variable, \( m \) is the slope, \( x \) is the value of the independent variable, and \( b \) is the y-intercept [4]. Linear regression analysis uses a series of \( y \) values and a series of \( x \) values to estimate both \( b \) and \( m \). In addition, the analysis provides a value that indicates the strength of the relationship between the \( x \) and \( y \) variables. This value is the correlation coefficient (\( r \)). The correlation coefficient can range between -1 and 1, where -1 indicates a perfect negative (inverse) relationship, 0 indicates no relationship, and 1 indicates a perfect positive relationship between the \( x \) and \( y \) variables. The value of \( r^2 \) (the coefficient of determination) is also a useful statistic calculated using regression analysis. It can range between 0 and 1 and indicates the proportion of the variation in the \( y \) variable that is explained (associated) with variation in
the x variable. In our study we used linear regression analysis to test the hypotheses that (1) the size of a pit trap is dependent on the size of the antlion that constructed it and (2) the ability of ants to escape from antlion pit traps is dependent on the size of the pit traps.

2. Methods

We used Wofford College’s Goodall Environmental Studies Center as the study site for data collection. Two lab sections of SBIOw301L (Ecology and Evolutionary Biology lab course) collected data on 9/14/11 and 9/15/11, respectively. We divided the students in each lab section into groups of three for data collection. In order to test hypothesis one, each group was responsible for collecting data on 10 antlions and their pit traps. For each pit trap and antlion used, students followed a particular sequence of data collection. First, they used a standard ruler to measure the diameter of an antlion pit trap (to the nearest millimeter). Once they recorded the pit diameter measurement, they scooped up the sand encompassing the pit trap in order to capture the antlion associated with the trap. Once captured, a group member measured the total body length of the antlion (to the nearest millimeter).

Once each group completed data collection for hypothesis one, they proceeded to collect data relevant to testing hypothesis two. We found an ant colony and scooped a large number of ants into a holding bucket. Each group used a particular sequence of data collection to evaluate how long it took ants to escape from pit traps. First, one group member measured and recorded the diameter (to the nearest mm) of a pit trap. While the pit trap was being measured, another group member obtained an ant from the holding bucket. This group member brought the ant back to the measured pit trap and dropped the ant into the center of the pit trap. As soon as the ant hit the ground, the third group member used a stop watch to record how long it took the ant to escape (in seconds). The procedure was repeated by all groups for the remainder of the lab period.

We used linear regression analyses to evaluate (1) the relationship between antlion size and pit trap diameter, (2) the relationship between pit trap diameter and ant escape time. To demonstrate the effect of sample size and outliers on statistical analyses, we conducted the regression analyses on each lab’s data and combined data collected from both lab sections when examining the relationship between antlion size and pit trap diameter. We used data combined from both lab sections when examining the relationship between pit trap diameter and ant escape time. We used EXCEL (2007) for data management and analyses.

3. Results

Hypothesis 1
The students captured 159 antlions and measured the diameter of their respective pits. Antlion lengths ranged from 0.3mm to 20.0mm in Laboratory Section 1 and 2.0mm to 14.0mm in Laboratory Section 2. Pit trap diameters ranged from 5.0mm to 90.0mm in Laboratory Section One and 5.0mm to 84.0mm in Laboratory Section Two. For each lab section and the combined data set, we found a positive association between antlion length and pit trap diameter (Figures 1-3). The regression equations and correlation coefficients
that described the relationship for each lab section’s data and the combined data set are presented in Table 1. Linear regression analyses indicated that the positive relationship between antlion length and pit trap diameter was statistically significant (p<0.01) in all data sets, however the coefficient of determination varied from 0.31 to 0.63 (Table 1).

**Hypothesis 2**
The students measured the diameter of 172 individual pit traps and recorded the time it took for ants to escape from the traps. The pit trap diameters ranged in size from 1.5mm to 135mm, and the ant escape times ranged from 0.15 seconds to 324 seconds. We found a positive association between pit trap diameter and ant escape time (Figure 4). The regression equation that summarized the relationship was $y = 0.8x + 26.9$ and the correlation coefficient ($r$) was 0.22. Linear regression analysis indicated that the positive relationship between pit trap diameter and ant escape time was statistically significant (p=0.02). However, only 5% of the variation in ant escape time was explained by variation in antlion pit size.

**Table 1.** Results of linear regression analyses investigating the relationship between antlion length and antlion pit diameter. N = sample size.

<table>
<thead>
<tr>
<th>Data Set</th>
<th>N</th>
<th>Regression Equation</th>
<th>Correlation Coefficient (r)</th>
<th>Coefficient of Determination ($r^2$)</th>
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<tbody>
<tr>
<td>Laboratory Section One</td>
<td>79</td>
<td>$y = 2.46x + 18.67$</td>
<td>0.56</td>
<td>0.56</td>
</tr>
<tr>
<td>Laboratory Section Two</td>
<td>80</td>
<td>$y = 4.15x + 8.67$</td>
<td>0.78</td>
<td>0.63</td>
</tr>
<tr>
<td>Combined Data Set</td>
<td>159</td>
<td>$y = 3.12x + 14.76$</td>
<td>0.66</td>
<td>0.43</td>
</tr>
</tbody>
</table>

**Figure 1.** The effect of antlion length on pit trap size for the combined data set.
Figure 2. The effect of antlion length on pit trap size for laboratory section one.

Figure 3. The effect of antlion length on pit trap size for laboratory section two.

Figure 4. The effect of pit diameter on ant escape time for the combined data set.
4. CONCLUSIONS

Data we collected during this study supported our hypotheses that antlion length impacts pit trap diameter and pit trap diameter impacts the ability of ants to escape from the traps. In each case, the variables were positively associated and the relationship was mathematically significant (p-values were less than 0.05). However, the $r^2$ values were low, indicating that the predictive nature of each relationship was weak. Overall, less than 50% of the variation in the dependent variable was explained by variation in the independent variable. From an ecological standpoint, this indicated that there are other factors impacting both the size of pit traps and the likelihood that ants will escape from pit traps.

In addition, we demonstrated how mathematical results can vary as sample groups change. For example, the combined data set coefficient of determination (i.e., $r^2=0.43$) was intermediate between each laboratory section’s coefficient of determination (i.e., $r^2=0.31$ and $r^2=0.63$). The results allowed for discussion of factors that might have contributed to the differences between lab section results. Factors that we discussed included measurement error, group biases in what size traps were targeted for measurement, and variation in the age of the pit traps sampled. These factors could themselves become the focus of future independent research or class projects.

Future studies could also extend our work by having students design experiments exploring the impact of factors other than antlion size on pit trap size. Similarly, the outcomes from the study can be used to have students design experiments exploring additional factors that impact antlion foraging success. A starting point would be instructing students to conduct literature searches for published studies that have identified factors impacting pit trap size and foraging success of antlions. They would discover that factors such as soil particle size, sand depth, feeding regime and conspecific density can impact pit trap size and antlion foraging success (e.g.,[5]-[6]). The results of their literature searches could be integrated into a class discussion of their project results, individual lab reports summarizing the project, or the design of future experiments.

Experiential, inquiry-based learning opportunities that increase the level of student engagement are the focus of many recent curriculum initiatives [7]. Ecology courses provide an ideal conceptual framework for developing integrative, interdisciplinary field studies that use the outdoors as a classroom and expose students to the process of science [8]. Field exercises allow students to work with organisms in their natural environment, which is relevant to topic coverage in a discipline focused on understanding how the environment impacts the distribution and abundance of organisms on the planet. Field settings allow students to practice scientific measurement and data collection in a more dynamic setting relative to that of a traditional classroom. Practicing science in less predictable settings facilitates the development or refinement of reasoning and critical thinking skills. Our laboratory exercise represents one example of a hypothesis-driven field study that engaged students as active researchers and demonstrated the role of biostatistics in ecological investigations.
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We thank the SBIO301 students who helped collect data for this project. In addition, we are grateful to Wofford College, in particular Dr. Kaye Savage and Dr. John Lane, for allowing us to use the Goodall Environmental Studies Center as an outdoor classroom. We appreciate that the Office of Sponsored Awards and Research Support financially sponsored Chelsea Kross as a Teaching Assistant for SBIO 301 during the Fall 2011 semester.

REFERENCES

**Sam Gilliam: An African-American Artist Following His Own Vision**

**Abstract.** Sam Gilliam (b. 1933-) is a painter of the Washington Color Field School. He creates abstract draped canvases and collages. Although he is African American, he made the decision to not portray overtly “black” images, or symbolism in his artwork. That decision has led to more acceptance of his work in the highly competitive, often exclusive, white-dominated world of museums and galleries. It has also brought criticism from some African American artists, who feel it the responsibility of black artists to present Afrocentric themes and images in their work. The problem is that these types of themes tend to keep African American art separate from “mainstream” art. This paper explores the history behind the categorizing of, and dismissal of “black” art by curators and patrons. It also explores the decision of Gilliam, as well as other black artists, to pursue their own course of aesthetics in an attempt to gain more exposure, as American artists. While Gilliam has been highly successful in his career, the reality is that most contemporary African American artists who attempt various styles in order to gain acceptance in the mainstream art world find the doors only slightly open. Sam Gilliam is still the exception, rather than the rule.

**Peggy Simon** is a divorced mother of two children. Raised on the Lower East Side of New York City, she spent many years living in Atlanta, Georgia, working as a civil drafter while raising her daughters. Several years ago, she relocated to Spartanburg, South Carolina where she decided to return to school in hopes of fulfilling her dream of earning a degree in art. She is currently enrolled in Interdisciplinary Studies with an emphasis on studio art and art history. She has found the return to school both challenging and exhilarating. She is having the time of her life.

**Dr. Rachel Snow** is an Assistant Professor of Art History and has been at USC Upstate since 2006. Her research area is the History of Photography. She has a Ph.D. from the City University of New York Graduate Center and has published articles in *Afterimage* and *The Journal of American Culture*. She has made presentations at the Annual Association of Art Historians Conference and the American Culture Conference. Dr. Snow is originally from Salt Lake City, Utah, and lived and worked in New York City for 10 years before coming to USC Upstate.
1. Introduction

Sam Gilliam’s paintings are described as sculptural for their shapes which are twisted, cut, suspended from the ceiling, or placed on the floor. These are Gilliam’s draped paintings, innovative works, the first of which was created in the 1960’s. Gilliam’s technique involves the discarding of stretchers on his canvases. This allows him the freedom to manipulate, tie, and hang his canvases. These pieces then become not only paintings, but also sculptures and architecture; the viewer becomes a participant in the work, able to walk around, through and under many of the pieces. The average viewer would not be able to ascertain from his work that Gilliam is African American. His abstract style aims to reach a wide, even a universal audience, but it was questioned by some critics in the 1960s and after, who felt that black artists should depict the black experience. These critics wanted to see identifiable subject matter that related to politics and identity in the African American community. This type of art is often referred to as “black” art. [1] A History of African-American Art states: “Although never satisfactorily defined, black art was characterized as a realistic or figurative art created by black artists, addressed to black Americans that communicated a spirit of black pride and solidarity, of power and militancy in the struggle for full rights as Americans.” This paper weighs the pros and cons of this debate and provides Sam Gilliam’s biography and a historical context for his works.

2. Methods

Research began with the gathering of printed materials related to the trends, and artists of the Harlem Renaissance, the civil rights era, and the Black Power Movement. Also, journal articles were retrieved from the internet pertaining to the lack of exposure for black artists in mainstream exhibitions. Next, printed and journal materials were obtained of biographical information of Gilliam, as well as critical analysis of his works. Finally, in order to get insight into Gilliam’s views, in his own words, interview transcripts were retrieved from the internet.

3. Gilliam’s Biography

Sam Gilliam was born in Tupelo, Mississippi in 1933. He grew up in Louisville, Kentucky, where, after receiving a Master’s degree of Fine Arts from the University of Louisville, taught art in the public school system. He married in 1962, moved to Washington, D.C. where he also taught, and became involved with the Washington Color Field School.

Gilliam decided early in his career to seek a vision other than black art. This decision had its foundation in graduate school at the University of Louisville, where Gilliam studied with internationally renowned artists, Ulfert Wilke and Charles Crodel, both of whom had respectively, barely escaped, or been victim to, the atrocities inflicted on Jewish people by Nazi Germany. Wilke and Crodel, because of their experiences as part of the Jewish Diaspora, had empathy with the black art students, and nurtured them. In addition to art courses, black students were urged to take courses in art education as a back-up plan. [2] Gilliam was influenced by both Wilke, who was an Abstract Expressionist, and Crodel, who was a German Expressionist. [3] He was also influenced by the works of the Bay Area artists, David Park, Richard Diebenkorn, and especially Nathan Oliveira. These artists
steered away from the trend of non-objective imagery and toward an abstract figurative style. Gilliam had to make a decision on whether to pursue figurative painting or delve into abstraction. The Bay Area style gave him the opportunity to gradually move in the direction of abstract painting.

4. GILLIAM’S ART IN CONTEXT

The decision to paint abstractly has led to criticism of Gilliam’s artwork by some in the African American community for its lack of black imagery. He has been accused of ignoring the plight of blacks in his works, and essentially viewed as a traitor. Since the period of the Harlem Renaissance in the 1920’s, black artists have been urged to present images in their works relevant to the black community. Black scholars W.E.B. DuBois and Alain Locke advocated the creation of art from an African perspective. Locke, the first African American Rhodes Scholar, in the book entitled *The New Negro*, 1925, praised artist, Aaron Douglas’ works for its proud portrayal of his people. Locke states in the book: [4] “We ought and must have a school of Negro art, a local and racially representative tradition.” Aaron Douglas was one of the many black artists to follow in this tradition. *Crucifixion*, 1927, is one of seven illustrations rendered by Douglas for James Weldon Johnson’s book, *God’s Trombones*, 1927, and is of an abstract African style. Another was Augusta Savage, a portraitist, whose sculpture entitled, *Lift Every Voice and Sing (The Harp)*, 1939, was commissioned for the 1939 New York World’s Fair. It was inspired by James Weldon Johnson’s poem of the same name, which is sometimes called the Black National Anthem.

Over time, the call to produce black art dwindled, but had a strong resurgence during the civil rights era of the 1960’s, and the Black Power movement of the 1970’s; to some extent, it remains true even today. Educator and activist, Ron Karenga, (creator of Kwanzaa) in an excerpt from [5] *Black Cultural Nationalism*, 1968, stated: “For all art must reflect and support the Black Revolution, and any art that does not discuss and contribute to the revolution is invalid, no matter how many lines and spaces are produced in proportion and symmetry and no matter how many sounds are boxed in or blown out and called music.” Gilliam’s works have tended to skirt the racial themes. His early figurative works, which are similar in style to that of the Bay Area artists, seem raceless, and with no political agenda, as illustrated by *Untitled*, c. 1961, oil on canvas (Fig. 1). This is a moody piece of a lone figure standing in a space devoid of surroundings.

6. THE EARLY YEARS

After joining the Washington Color School movement, Gilliam became enthralled with the art of Hans Hoffmann, and his theory of composition building contained in the phrase, [6] ”Push answers with Pull, and Pull with Push”. The resulting experimentation with bold
colors produced such works as Shoot Six, 1965, acrylic on canvas (Fig. 2). The vivid colors of reds, yellows and blue, converge at the lower right corner of the canvas, and flare upward and outward diagonally, contained only by crisp white lines, and creating a dynamic composition.

Gilliam began to experiment in new ways of making images by pouring paint onto the canvas, by raking the paint across the canvas, or by staining it. An example of the result is Red Petals, 1967, acrylic on canvas (Fig. 3), which, as described by title is basically red. Unlike Shoot Six, there are no hard edges here. It has hazy shapes of blue and yellow which seem to bleed or float on the red field.

Seeking an innovative approach of presenting his artwork, [7] Gilliam began using beveled edges on his pieces, an idea which he has admitted stealing from another artist, Ron Davis. Using chamfered stretchers allowed Gilliam to bring a new dimension to the canvas, away from the flat surface of the wall, as demonstrated with the treatment of Snakebite, 1968, acrylic on canvas (Fig. 4). The back edges are chamfered, and according to [8] Binstock, “appear to float and sometimes even to slip and slide, detached from the gallery wall.”

Eventually, Gilliam eliminated stretchers, altogether, leading the way to his most acclaimed works of art. He began creating the draped paintings, such as Light and Death, 1969, acrylic on canvas, 120” x 900” flat (Fig. 5). It hangs as a site-specific installation. It has swirls and twists that drape almost from the ceiling to the floor at the intersection of two walls.

7. Politics vs Abstraction

In answer to some black criticism of his work, Gilliam has indicated that while he admires the militant black artists’ contributions, he feels that it is just as important to pursue his own style, and to gain access into the mainstream world of art. Gilliam has also been criticized for his ambivalence toward civil rights issues. His participation in the 1963 March on Washington was his last time supporting those causes. According to [9] Jonathan P. Binstock, “Gilliam emerged from the movement disenchanted’, wrote Vivian Raynor in a 1974 human interest story on the artist for the New York Times Magazine: ‘Not only did white intransigence, especially in the unions, remain virtually unchanged, he felt, but the sum total of his activism had amounted to little more than gaining political honors for others.”

After the assassination of Dr. Martin Luther, Jr. on April 4, 1968, Gilliam painted a series of abstracts dedicated to the slain civil rights leader, including Red April, 1970, acrylic on canvas (Fig. 6). Although not depicting black imagery, the red splatters across the canvas evoke images of historical violence inflicted on blacks, and the title gives a clue to
the fateful event symbolized. Gilliam immortalizes Dr. King in his own style. He strives with imagery, color and title to elicit a universal response of anguish.

In January, 1969 Gilliam participated in a symposium [10] which included Romare Bearden, Richard Hunt, Jacob Lawrence, Tom Lloyd, William T. Williams and Hale Woodruff. During the symposium, Gilliam, while speaking of the importance of the past, stated: “This was the overriding consideration: What the artist was concerned with and what I looked for as a kid, and what I dealt with when I was painting figuratively. But later on, you’re a mature artist, maybe a great one, if you can personalize yourself, move from identification with something outside yourself to your own thing.”

Gilliam spoke of the absence in quality of artistic knowledge within the black community. He questioned why, during the Washington, D.C riots, when whites stayed in the suburbs, museum attendance fell so drastically. He also spoke of the need for better art education, focusing on [11] “the quality of aesthetic experiences available to persons within the Black community, and raising the level of this quality.”

This statement gained validity in June, 1969 when Gilliam, William T. Williams, Melvin Edwards, and Stephan Kelsey (a white artist) held an exhibition at the Studio Museum of Harlem entitled, X to the Fourth Power. The Harlem community was outraged by their art, and [12] “by the time the show closed, abstract artists, particularly Gilliam … were discouraged from exhibiting there in the future.”

The issue of raising the level of aesthetic experiences does not only exist in the African American community, but in the community as a whole. The scope of art education needs to be re-evaluated. The question is: why is most of the work created by black artists separated from “mainstream” art? Why is there exclusion? So much of the so-called black art of the past and present is not militant in nature. But it does contain Afrocentric images, from which white curators tend to shy away. African American artists receive minimal exposure in mainstream venues, and when exposure occurs, it is usually in exhibitions designated to African American art. One such exhibition entitled The Chemistry of Color – Contemporary African American Artists, was held at the Columbia Museum of Art from February 5 – May 9, 2010. Works of Sam Gilliam, Jacob Lawrence, Romare Bearden, Faith Ringgold, Betye Saar and many other African American artists were exhibited. With the exception of Gilliam, Bearden and Saar, these artists’ works are rarely seen outside of this type of venue. Sam Gilliam’s experience raises the question of how the art community can generate interest in artwork that transcends cultural and racial lines and, without qualifying the term “American” represent all genres equally, as American art.
In the world of museums and galleries “high” art has always been judged by European aesthetics, with ethnic art often being de-valued, or belittled. At times, it has led to cultural appropriation, described as [13] “the superficial and inappropriate copying or mimicking of cultural artifacts and symbols.” It has also been subjected to sexual connotations. The history of these perceptions is complex, but involve the long period of colonization and domination of third world people. These people were considered savages, their artwork primitive, and therefore unworthy of consideration as “high” art. The intrinsic impulse among the hierarchy of the art world is to dismiss anything related to “primitive.” The terms “Primitivism” and “Orientalism” are used to describe the fascination held by Europeans for non-western cultures, the pre-conceived ideas of the naivety of these cultures, and fantasies revolving around the women of these cultures, as sexual objects.

Even early modernist artists who claimed admiration for, and inspiration from African sculpture and masks, portrayed images derived from African artwork as sensual, yet grotesque. In her article [14], Making Primitive Art High Art, Duke University Professor, Marianna Torgovnick states: “Continuing and expanding an older tradition of using blacks as signs of sensuality, paintings of the modern movement, from Manet’s Olympia to Picasso’s Demoiselles d’ Avignon, had used blacks and black art in connection with debauchery, especially in the depiction of prostitution and brothel life.” Although Gilliam’s works are not overtly ethnic, and do not conjure up images of things to be feared or sexualized, they are, I would argue, inherently African or African American. The bold patterns and colors are reminiscent of the designs found in African textiles. Artist and art historian, David C. Driskell [15], feels that Gilliam’s works are the “equivalent to jazz, blues and gospel” in black American creativity.

Sam Gilliam’s works are highly sought after, in this country as well as others. They are not only included in numerous museum and gallery collections such as the aforementioned Studio Museum in Harlem, the Museum of Modern Art in New York, and the Smithsonian American Art Museum in Washington, D.C., but also in religious and public spaces. Gilliam created a temporary installation entitled Of Fireflies and Ferris Wheels: Monastery Parallel, 1997, polypropylene (Fig. 7) for the chapel gallery of the Kunstmuseum Kloster Unser Lieben Frauen in Magdeburg, Germany. Another piece, Color of Medals, 1998, (Fig. 8) is constructed of acrylic, polypropylene, and digital prints on birch plywood with aluminum and piano hinges, and installed at the Department of Veterans Affairs in Philadelphia, Pennsylvania.

**8. RESULTS AND DISCUSSION**

Currently, the works of African American artists, while grossly underrepresented, are gaining more exposure in the mainstream art world. According to a 2012 article in [16] Huffington Post, “Relatively few art galleries and museums in the United States show the work of African-American artists, creating a problem of invisibility that suggests black artists and their work do not exist.” While younger black artists pursue a variety of styles,
most are still pigeon-holed into exhibitions dedicated to African American artists. Even today, Sam Gilliam is an exception among blacks in the art world.

9. CONCLUSIONS

The kind of success achieved in the art world by Sam Gilliam is rare for any artist, black or white. He had a vision and, although criticized by some, remained adamant in his convictions. Hopefully, he has opened the door for young African Americans to participate in a variety of styles of art, as artists and as viewers. Aaron Douglas’ and Augusta Savage’s works are wonderful, but so are the works of Alma Thomas, William T. Williams, and Sam Gilliam.

As artist, Raymond Saunders stated in his 1967 pamphlet entitled, [17] Black is a Color: “Racial hang-ups are extraneous to art, no artist can afford to let them obscure what runs through all art—the living root and the ever-growing aesthetic record of human spiritual and intellectual experience. Can’t we get clear of these degrading limitations, and recognize the wider reality of art, where color is the means and not the end?” These words are more relevant today than ever.

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