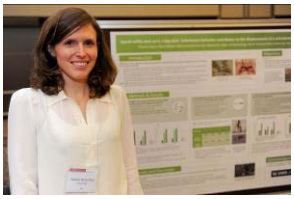
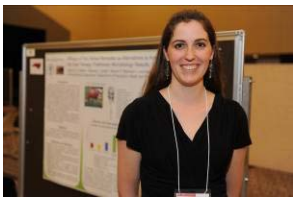
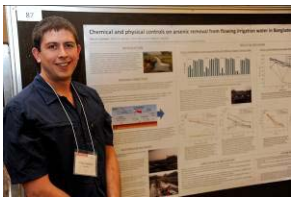
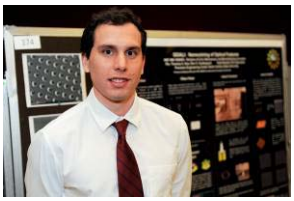
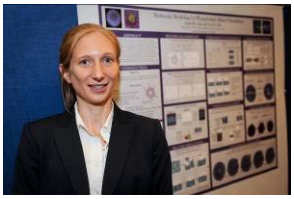
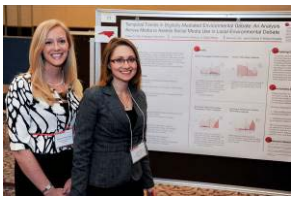
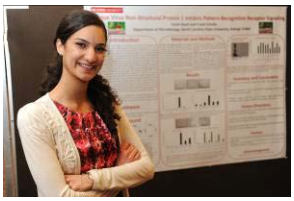
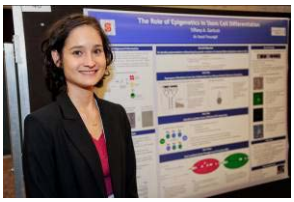
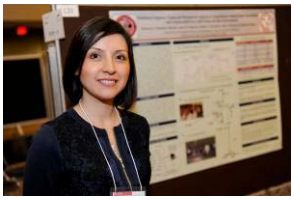
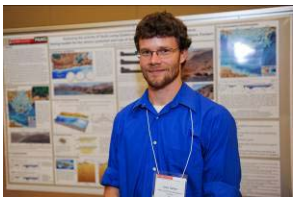
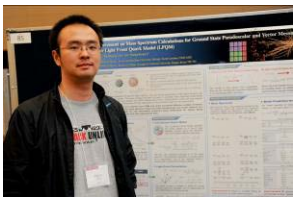
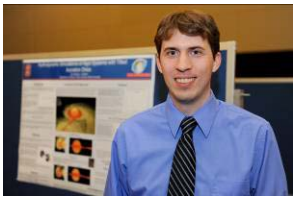
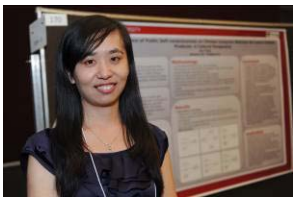
Seventh Annual Graduate Student Research Symposium

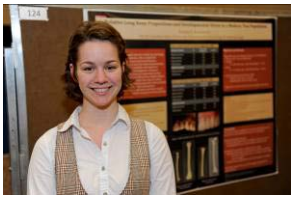
Congratulations to the winners of the Seventh Annual Graduate Student Research Symposium! Each year, the Symposium showcases the outstanding quality and diversity of graduate-level research at NC State. The Symposium was held on March 20, 2012 at the McKimmon Center. First-, second-, and third-place winners have been announced in seven categories.

AGRICULTURAL SCIENCES	
	**Eleanor Spicer Rice** (Entomology) won first place for her work, *Speak Softly and Carry a Big Stick: Submissive Behavior Contributed to the Displacement of a Unicolonial Global Invader*. The study explores the essential challenge in invasion ecology -- discerning the role behavioral adaptations play in competition between species. Specifically, Spicer Rice examined the behavioral mechanisms underlying the displacement of the established global invader, the Argentine ant, by the newly invasive Asian needle ant.
	**Keena A.E. Mullen** (Animal Science) took the second-place award for *Efficacy of Two Herbal Remedies as Alternatives to Antibiotics in Dry Cow Therapy: Preliminary Microbiology Results*. Mastitis is a costly disease in the dairy industry and is normally treated using antibiotics either in response to clinical cases of mastitis or for prevention when the cows are not lactating (the 'dry period'). Mullen's study evaluated the effectiveness of two herbal remedies -- Phyto-Mast (Penn Dutch Cow Care) and Cinnatube (New AgriTech Enterprises). The combination of the two herbal products was better than conventional antibiotic dry cow therapy in curing existing infections, suggesting a viable alternative to antibiotics for dry cow therapy in dairy cattle.
	**Ethan Lineberger** (Soil Science) presented *Chemical and Physical Controls on Arsenic Removal from Flowing Irrigation Water in Bangladesh* and won third place in the Agricultural Sciences category. Years of irrigating rice fields with arsenic-contaminated well water in Bangladesh have led to a buildup or arsenic in soils and subsequent translocation or arsenic into rice. Recent studies indicated that contaminated rice may contribute up to 66% of daily dietary arsenic intake. This study examines the physicochemical controls on arsenic removal from flowing irrigation water based on variations in channel widths and lengths. Preliminary positive results will be used in future experiments assessing limits on arsenic removal and long-term sustainability of alternate irrigation management strategies.
EDUCATION	
	**Meixun Zheng** (Curriculum and Instruction) took the first-place award in the Education category for her study, *Fifth Graders' Flow Experience in a Game-Based Science Learning Environment*. The rising popularity in digital game-based learning has prompted increased attention to student emotion and subjective experience during gameplay. This study examined fifth graders' enjoyable experience in the *Crystal Island* game based science learning environment through the lens of flow theory. The findings demonstrated that students had high game flow experience, but there was no difference based on gameplay approaches (solo and collaborative gameplay). The results also revealed important game design and personal factors that impacted students' flow experience. Students made significant content learning gains, but flow experience was not found to be a predictor of science learning gains.

	**Richelle C.R. Dietz** (Mathematics Education) won second place for her work, *The Relationship Between Classroom Episodes and Students' Understanding of Variable: A Mixed Methods Study*. Teachers and researchers often wonder what leads students to erroneous understandings of concepts. Misconceptions of variable inhibit students' abilities to create, explore, and interpret mathematical models such as linear programs. This study examines students' understanding of variable, based on data collected from students in a fourth-year high school mathematics class.
	**Tanya Watson** (Curriculum and Instruction) won third place in this category with *Gaining an Edge: Re-Discovering the Read-Aloud Strategy for Middle School Students.* Although the Commission on Reading has recommended that educators read aloud to students 'throughout the grades', the read-aloud strategy and read-aloud research historically have been conducted mostly on the elementary school level. This qualitative study examines how 'read-alouds' are being delivered and structured at the middle school level. Major findings indicated that (1) delivery of the read-aloud for the middle school teachers involved focused on visualization techniques, engagement strategies, and opinion-shaping and (2) the read-aloud as a strategy is still in transition on the middle school level in areas regarding traditional verbal exchange, whole class instruction, and related practices.
ENGINEERING	
	**Erik Zdanowicz** (Mechanical Engineering) won the first-place award in the Engineering category for *Nanocoining Optical Features for Anti-Reflective Surface Generation*. Anti-reflective coatings are used in many optical systems, such as eyeglass, telescope, and camera lenses, as well as on covers of photovoltaic cells. Full-spectrum light is composed of many different wavelengths; however, anti-reflective coatings are only effective over single wavelengths and near normal viewing angles. The objective of this research is to develop a system capable of creating sub-micrometer features at a high rate -- microstructures that can control propagation of light, adhesive and wetting forces, magnetic behavior, cellular activity, and surface area, as well as chemical reactivity.
	**Emily Curtis** (Chemical and Biomolecular Engineering) earned second place in the Engineering category for her work, *Multiscale Modeling for Phospholipid Bilayer Simulations*. Liposomes have gained much attention recently due to their ability to mediate the intracellular delivery of cancer therapies. Two major goals of liposomal anti-cancer drug delivery are to promote the accumulation and retention of drug-carrying liposomes in tumor cells and to trigger the release of drug molecules inside the cells. This study explores a multiscale modeling approach to aid in the design and optimization of these drug delivery vehicles.
	**Babak Parkhideh** and **NIma Yousefpoor** (Electrical Engineering) took the third-place award for *Design Considerations in Development of Active Mobile Substations*. This study examines transmission-level active mobile substations that provide backup in case of power transformer failure or forced reduction in operation scenarios, as well as power flow control for seasonal renewable energy transmission. The proposed technology -- Convertible Static Transmission Controller -- is transportable, can be connected across the substation power transformer, and can also be reconfigured to the required mode of operation.

HUMANITIES AND DESIGN	
	**Jessie Braverman** and **Shawna Hammon** (Architecture) shared the first-place award for their presentation, *A Look at Prototypical Architectural Design and Its Potential Uses as Shelter*. Throughout its long and celebrated history, prototype architecture has been used to alleviate a variety of the world's shelter issues. The goal of this research was to examine prototype design and search for a module that could be used to produce lightweight, efficient, affordable, and semi-permanent shelter to be used around the world. This study also investigated construction and materials, resulting in a structure called the Folding Modular Retreat.
	**William Dodge** (Architecture) won second place in the Humanities and Design category for *'Modern' Warfare*. This study focuses on the design and development of multiple rapid deployment mobile base-camp systems. They are sustainable in all weather environments and tactical situations in addition to having possible use as emergency housing.
	**Ashley R. Kelly** and **Meagan Kittle Autry** (Communication, Rhetoric, and Digital Media) earned third place for their presentation entitled, *Temporal Trends in Digitally Mediated Environmental Debate: An Analysis across Media to Assess Social Media Use in Local Environment Debate*. Purportedly acting as a catalyst for revolutions around the world, social media sites have gained considerable and contested attention from communication scholars. The exact role of such sites in inciting or organizing protests remains unclear. This study addresses how social media is used to report and respond to the merger of Duke Energy and Progress Energy, specifically, how discussion of environmental and economic issues unfolded online.
LIFE SCIENCES	
	**Farah Alayli** (Immunology) was awarded first place for *Dengue Virus Non-Structural Protein 1 (NS1) Inhibits Pattern Recognition Receptor (PRR) Signaling*. Both Dengue Virus and West Nile Virus are RNA viruses that are transmitted to humans by mosquitoes, and both viruses can cause life-threatening conditions. Our research is aimed at comparing the immunemodulatory function of Dengue and West Nile NS1 in an effort to better understand the virus-host interaction during dengue infection.
	**Tiffany Garbutt** (Genetics) won second place for her work, *Identifying Genes Controlling Epigenetic Stability in Induced Pluripotent Stem Cells (IPSCs)*. Induced pluripotent stem cells (iPSCs) are differentiated cells that have been reprogrammed back into an embryonic stem cell like fate using four embryonic stem cell transcription factors. However, iPSCs retain an epigenetic memory of their previous cell fate and exhibit incomplete reprogramming of specific methylation sites. This study aims to identify, test, and confirm key genes influencing the genetic variation of retained DNA methylation marks in induced pluripotent stem cells generated from a genetically diverse mouse population.
	**Macarena Quintana-Hayashi** (Comparative Biomedical Sciences) placed third in the Life Sciences category for her work, *Multilocus Sequence Typing and Phylogenetic Analysis of 'Campylobacter' Isolated from Conventional and Antimicrobial-Free (ABF) Swine and their Environment*. *Campylobacter* is one of the leading causes of foodborne diarrhea illnesses in the U.S. and a significant public health concern worldwide. Epidemiological evidence has indicated that food animals, including pigs, act as reservoirs of *Campylobacter* strains that can infect humans. This study examines the clonality or

	diversity of *Campylobacter coli* isolated from conventional and ABF production systems at farm, slaughter, and environment using multilocus sequence typing.
MATHEMATICAL AND PHYSICAL SCIENCES	
	**Sean F. Gallen** (Marine, Earth and Atmospheric Sciences) won first place for his poster entitled, *Assessing Fault Activity Using Quaternary Marine Terraces: Testing Models for Earthquake Hazards and Topographic Development above the Hellenic Subduction Zone Crete, Greece*. Two competing models have been put forward to explain how deformation is accommodated in the overriding plate of the Hellenic subduction zone -- the largest, fastest, and most seismically active subduction zone in the Mediterranean. This objective of this study is to test these different hypotheses in order to improve estimates of seismic hazards throughout the Eastern Mediterranean and to provide insight into the construction and architecture of offshore basins that may maintain economically recoverable hydrocarbon resources.
	**Ziyue Li** (Physics) earned second place with his work entitled, *Improvement on Meson Spectrum Calculation in Light Front Quark Model*. The study of mesons, one big family of hadrons consisting of one quark and one antiquark, gives information about how things are structured and how they interact at the smallest scale that we can probe today. The object of this study is to improve one of the phenomenological models for mesons to get a better fitting for the mass spectrum. The improved wave function can then be used to calculate various observables such as decay constants and General Parton Distributions that can be extracted from experimental data.
	**Eric Raymer** (Physics) took third place for his work, *Hydrodynamic Simulations of Algol Systems with Tilted Accretion* Disks. Algol systems are close binaries consisting of two main sequence stars, one of which has begun to evolve and transfer mass to the other via an accretion stream. Recent observations have detected the presence of a tilted accretion disk in the Algol system RS Vul and suggest the presence of a magnetically deflected accretion stream. This study investigates the role that hydrodynamic effects play in this process after the stream has been magnetically defected.
SOCIAL SCIENCES AND MANAGEMENT	
	**Amy Garrett** (Anthropology) won first place in the Social Science and Management category with *Osteological Analysis of a Late Woodland North Carolina Ossuary*. This research focuses on the Piggot ossuary site (AD 1420-1640) in coastal North Carolina, and specifically, the demographic profile of the site based on skeletal remains found at the site. Of the 121 individuals inventoried from the site, there was a significantly higher-than-expected percentage of subadults. In addition to other prominent pathologies, such as osteoarthritis, periostitis and possibly scurvy, there was also a presence of congenital syphilis. While not conclusive, the Piggot sample might represent a Native American population experiencing the first wave of disease resulting from European contact.
	**Rui Yang** (Textile and Apparel, Technology and Management) earned second place for her poster on *Influence of Public Self-Consciousness on Chinese Consumer Behavior for Luxury Fashion Products: A Cultural Perspective*. With the growing rise of the economic and purchasing power, China has become the world's second largest luxury market in 2009 and China's market keeps growing rapidly. The objective of this study is to investigate the influence of public self-consciousness on Chinese consumers' motivations (social identification, social salience, and self-oriented motivation) and intention for luxury consumption from a culture perspective (power distance, uncertainty avoidance and individualism).

	**Kristen Rectenwald** (Anthropology) took third place for her work entitled, *Relative Long Bone Proportions and Developmental Stress in a Modern Thai Population*. Research into relative (or scale free) limb proportions has revealed interesting patters of variability regarding environment. However, there have been no direct attempts to correlate variability in limb proportions with unrelated stress indicators. This study examines the relationship between long bone length ratios and linear enamel hypoplasia frequency in a modern Thai population. Results support the claim that distal limb growth is more strongly affected by developmental stress. Additionally, the upper and lower limbs demonstrate different responses to environmental stress.