Graduate Education Advancement Board

Impact Awards

2010

Graduate Students Serve

North Carolina

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THE GRADUATE SCHOOL
The University of North Carolina at Chapel Hill
The Graduate School of the University of North Carolina at Chapel Hill thanks the members of the Graduate Education Advancement Board for their generous financial support of these Impact Awards.
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From the mountains to the coast, Carolina graduate students’ research benefits North Carolina communities. The Impact Award recognizes and encourages graduate students whose research is making a difference to our state. Impact Awards are privately funded through generous contributions from the members of the Graduate Education Advancement Board of the Graduate School of UNC Chapel Hill.

Impact Award winners present their research, receive a cash award, and are recognized at the Annual Graduate Student Recognition event, this year on April 8, 2010, 3-6pm, at the George Watts Hill Alumni Center on the Carolina campus. A faculty review committee selected 16 projects to receive Impact awards.

This report briefly describes these research projects, which reach from one end of North Carolina to the other. They affect the economic development of our state, the quality of health and human services delivered to our citizens, and the quality of our educational systems and environmental resources.

Carolina graduate students’ research is clearly making a difference in the every day lives of North Carolinians across the state and beyond.

We hope you enjoy reading about the work of these exceptionally talented Carolina graduate students. These students, and many others like them at the University of North Carolina at Chapel Hill, are actively helping the residents of this state through their research. For more information, please go to our webpage: http://gradschool.unc.edu/ or contact us.

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The field of tissue engineering is continuously evolving as new materials are created and new medical information is gathered. Novel approaches to tissue engineering play an important role in the future of organ and tissue transplantation. Consistently, the need for organs far exceeds the potentially viable supply. Doctoral student Devin Barrett designed biodegradable polymers, a form of plastics, from several naturally occurring molecules and focused on a new methodology for creating artificial organs.

Dissertation advisor Muhammad Yousaf stated, “Devin’s research strategy has separated him from the rest of the field while highlighting his creativity. His research can help the field of tissue engineering become a more reliable alternative for patients suffering from organ failure.”

Currently, over 100,000 people in the United States need life-saving surgeries involving organ transplantation, and in North Carolina, over 3,000 people are on waiting lists. Of these, 45% have been forced to wait for more than two years, and 15% have had to endure their conditions for at least five years. Up to 50 people can be helped by one tissue donor, while one organ donor can save eight lives.

Devin believes that unconventional methods must be explored to circumvent the shortcomings of traditional organ donation. He forged a new direction in tissue engineering that may result in fully functional, artificial organs that can supplement organ donor programs.

The Effects of Local Sanctions

Graduated sanctions (a range of punishment options for offenders that allows consequences to vary based upon offense history and severity and individual factors) are used in every state juvenile justice system. In 2008, approximately 13,500 North Carolina youth were supervised by the state juvenile justice system. Of those, only 469 youth were committed to a secure facility for a long-term stay. Local supervision and provision of sanctions, therefore, are key elements of an effective juvenile justice system.

Recent graduate Valerie Cooley, Ph.D., used data from 93 North Carolina counties to examine implementation and effects of local sanctions for juvenile offenders. Her results indicated that greater availability of sanctions reduced juvenile crime and custody rates. Community-based residential programs had the strongest effect. Less densely populated counties and those with fewer financial resources had fewer available sanctions but political factors had the greatest effects on implementation.

Valerie’s study is the first statewide evaluation to assess the implementation and outcomes of juvenile justice reform legislation emphasizing community-based sanctions. Her results provide empirical support for recent state policy efforts to strengthen local sanctions and create community-based residential programs in lieu of large secure facilities for juvenile offenders.

Dennis Orthner, Valerie’s faculty advisor, said that Dr. Cooley conducted an innovative and ground-breaking assessment of the community-based sanctions policy. Her findings offer guidance to further strengthen local services for youth involved in the juvenile justice system.
Managing the Longleaf Pine Ecosystem

Jennifer Costanza, Environmental Sciences and Engineering

Natural areas provide many benefits to the people of North Carolina, including clean air and water, opportunity for recreation, and a basis for tourism. However, as the state’s population increases, urban areas are expanding, and conservation of natural areas is becoming more difficult. Doctoral student Jennifer Costanza examined conservation strategies that improve the management of North Carolina’s longleaf pine ecosystem.

Her research, which focused in eastern North Carolina, combined social science methods, including interviews and surveys, with spatial analysis to document management priorities and determine which conservation strategies are effective. Her findings indicated that partnerships among public and private entities are most effective in accomplishing preservation goals across landscapes. Collaboration can be particularly effective in restoring longleaf pine ecosystems because it enables landowners with diverse priorities to work together to minimize risks associated with restoration activities such as prescribed burning.

Jennifer’s research contributes strategies for longleaf pine conservation in North Carolina, and points to a key strategy for conservation of this ecosystem: better land use planning. Her results also have the potential to benefit the future of all of the state’s ecosystems.

Promoting Regular Mammography Screening

Jennifer Marie Gierisch, Health Behavior and Health Education

Each year, more than 1,300 North Carolina women lose their life to breast cancer despite effective screening through mammography. Increased levels of regular mammography screening at recommended intervals could reduce breast cancer deaths by 22% each year. This is especially important for North Carolina, which ranks in the top 15 states in breast cancer related deaths. This may be due, in part, to low rates of regular mammography use.

As a doctoral student, Jennifer Gierisch, Ph.D., aimed to examine why regular mammography use continues to be a challenge for many women. She used a longitudinal study design that included multiple assessments of predictors and mammography use over time. She found that most women (54%) did not maintain regular screening adherence over three years, even though all started the study with health insurance and recent screening mammograms. Women were more likely not to get regular mammograms if they were less satisfied with their last mammography experience, reported one or more barriers to getting mammograms, had weaker intentions, had fair/poor health, or were aged 40 to 49.

Results of Jennifer’s study may be used to help structure public health programs to promote regular mammography screening in North Carolina and beyond.

Jo Anne L. Earp, Jennifer’s dissertation advisor, said that Jennifer conceived of an original, potentially high-impact study of the problem of why insured women under-use regular mammography screening. Jennifer’s ultimate goal is to inform the design of programs and cost-effective strategies to increase the number of women in the state who are regularly screened for breast cancer.
Colorectal cancer is among the three deadliest cancers in the United States. Last year, the American Cancer Society predicted that more than 148,000 people would be diagnosed with colorectal cancer and about 50,000 of those would die, with an estimated 4,200 diagnoses and 1,400 deaths in North Carolina.

Using human colon cancer cell lines, doctoral student Kathryn Hamilton explored the role of a specific protein as an intestinal tumor suppressor. Her results indicated that the protein limits intestinal cancer by inhibiting an inflammatory, tumor growth-promoting receptor. This protein is silenced in cancers in other human organs, and her studies will determine if this protein is silenced in the intestine of patients who have increased risk of developing colorectal cancer.

Kathryn’s research has the potential to help establish the protein as either a drug target or a valid local inflammatory biomarker for colorectal cancer risk, which could help improve early detection and survival for North Carolinians.

While the No Child Left Behind Act of 2001 mandates that all children are learning according to certain standards, the application to the 1.1 million students in the United States who have moderate to severe intellectual disability (e.g., autism, Down syndrome, and other developmental disabilities) remains problematic. One reason these students are struggling to read is that few of their teachers have the training or materials necessary to teach literacy to students with these disabilities.

While a doctoral student, Penny Hatch, Ph.D., studied the effects of providing daily access to a wide range of age- and ability-appropriate texts to 43 adolescents with moderate to severe intellectual disability at a school in central North Carolina. Her results indicated that the students benefit from daily exposure to age- and ability-appropriate texts, but the effect is even greater when the exposure is provided by teachers familiar with comprehensive literacy instruction.

Penny’s results demonstrated immediate measured gains in the students’ achievement scores, and the school and its teachers have embraced the practice of daily reading opportunities as well as a comprehensive approach to literacy instruction. Her research has the potential to impact students with severe disabilities and their teachers across North Carolina.
Protecting our Soldiers from Chemical Weapons

Andrew C. Hemmert, Biochemistry and Biophysics

Nerve agent chemical weapons are some of the deadliest compounds ever created by man. The U.S. military is fighting two wars in regions where these agents have been used, and more than 15% of the deployed troops are from units stationed in North Carolina. The current treatments for nerve agent poisoning offer only limited protection and must be administered rapidly to be effective. An ideal treatment would be an intervention capable of quickly destroying a broad range of nerve agents.

Doctoral student Andrew Hemmert developed a protein-based therapy with the enhanced ability to detoxify nerve agents, up to 10,000-fold faster than current treatments. He is developing this designed protein into an injectable prophylactic to protect at-risk personnel, as well as miniaturized detectors to alert troops to the presence of specific nerve agents.

This novel protein is currently being tested for nerve agent protection at the United States Army Medical Research Institute of Chemical Defense, and is the most efficient designed protein of its kind to date. Andrew’s research has the potential to help advance the state’s biotechnology industry and save the lives of its soldiers.

Using Bacteria to Clean Contaminated Soil

Maiysha D. Jones, Environmental Sciences and Engineering

North Carolina has 32 sites on the federal National Priorities List (NPL), a.k.a. “Superfund” sites whose soils are contaminated with a major class of industrial pollutants known as polycyclic aromatic hydrocarbons (PAHs). These are among the top 10 hazardous substances found at NPL sites, and are found at both rural and urban areas from the mountains to the coast. This class of compounds poses an imminent threat to public health.

Doctoral student Maiysha Jones’ research focused on identifying bacteria responsible for the biodegradation of PAHs. Using a molecular tool called stable-isotope probing, Maiysha identified the bacteria in a complex soil sample that can degrade specific compounds without having to isolate the bacteria from the sample. She has also linked two groups of organisms to the biodegradation of two specific PAHs, and identified the major degrading group for another PAH in soil from a site in Salisbury, NC.

Maiysha’s research has the potential to contribute to a lower cost, environmentally friendly technology that will help reduce the risk of human exposure to potentially carcinogenic compounds and eventually allow for commercial development of previously contaminated sites.

Professor Frederic K. Pfaender stated, “Ms. Jones’ work is leading to new approaches to measuring how these specific degraders, which are initially a very small part of the natural community, can be stimulated and manipulated to achieve more rapid and cost effective remediation tools.”
**Communities and Health Related Quality of Life**

**Kathryn Remmes Martin, Health Behavior and Health Education**

The link between location and health is well established; research has shown that where one lives can positively or negatively influence health outcomes regardless of one’s own socioeconomic status. Health disparities exist in North Carolina and vary by geographic location; the number of unhealthy days reported is increasing and general health status is lower than national averages. As a doctoral student, Kathryn Remmes Martin, Ph.D., investigated the influence of community on health related quality of life.

Kathryn analyzed data from a sample of North Carolinians living in 32 NC communities. She found that the availability of public transportation, as well as the number of restaurants and hospital beds per 1,000 community residents predicted physical functioning, self-rated health, and the number of unhealthy vs. healthy days. Community poverty also predicted unhealthy days.

Better knowledge can help improve the health status reported by North Carolinians. Kathryn’s study helps us better understand which community resources influence health. This knowledge may help policy makers to better allocate resources so that state, local and federal dollars make the biggest impact on communities.

> Robert F. DeVellis, Kathryn’s dissertation advisor, said, “Kathryn’s findings indicated that both composite individual indicators and true community-level indicators were related to health in North Carolina communities. This work can serve as a basis for structural change at the community level that can improve the health status for North Carolinians.”

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**Piedmont Alluvial Vegetation**

**Elizabeth R. Matthews, Environment and Ecology**

Few pristine floodplain ecosystems remain in the southeastern United States. Historically, these ecosystems have been home to diverse and highly productive plant communities. Many of these landscapes have been destroyed or degraded, including those in North Carolina. Despite the ecological significance of floodplain plant communities and their current imperiled status, there is little understanding of floodplain vegetation in the state or elsewhere.

Robert K. Peet, Elizabeth’s dissertation co-advisor, said that her work promises to increase the success and decrease the cost of on-going wetland restoration programs within North Carolina. Her novel approach is broadly applicable and represents a major improvement over techniques applied across the country for legally required mitigation of wetland damage.

The goal of doctoral student Elizabeth Matthews’ research is to provide detailed vegetation information on bottomland hardwood forested wetlands for restoration activities in the North Carolina Piedmont. She collected data in the five major NC Piedmont river basins: the Catawba, Yadkin, Cape Fear, Neuse, and Tar. She used these data to develop detailed, vital records on the composition, structure, and physical setting of the best remaining examples of wetland vegetation throughout the NC Piedmont.

Elizabeth’s research has the potential to improve the success of restoration projects across the state. It also may provide a model for other states to develop and disseminate reference information for restoration activities.
North Carolina Growth: Where Will the Water Come From?

Timothy P. Morrissey, Geography

In recent years, drought conditions have left municipal water supplies at alarmingly low levels across the state. These periods of drought, compounded by regional population growth and economic development, demonstrate the need for a statewide system to assess the potential for expanding water supplies.

Timothy Morrissey, a doctoral student in the Department of Geography, developed a comprehensive decision support system for the identification of potential public water supply sources across North Carolina. Using North Carolina’s extensive inventory of publicly available geospatial data, including terrain data obtained from laser technology, his automated system analyzes the spatial pattern of population, environment, land-use, terrain and hydrologic capacity on a statewide scale. It then identifies potential sites by linking the physical feasibility with socio-economic impacts.

His research has the potential to impact the state, county and local government agencies charged with managing water resources. It may also impact the citizens of North Carolina, who depend on adequate water supplies as an essential component of public safety, security and well-being.

Cleaning Up Contaminated Soil Using Bioremediation

Stephen D. Richardson, Environmental Sciences and Engineering

Up to the mid 1900s, manufactured gas plants (MGP) were major sources of energy for cities and towns across the U.S. Poor waste management practices at these sites have resulted in the contamination of surrounding soils, sediments, groundwater and surface water with a variety of hazardous compounds, including polycyclic aromatic hydrocarbons (PAHs).

Doctoral student Stephen Richardson investigated the feasibility of treating contaminated MGP soil using in situ bioremediation, a technique that uses naturally-occurring soil microorganisms to degrade contaminants of concern. He collected soil from a former MGP site in Salisbury, NC and treated it in large columns with inorganic nutrients and oxygen to stimulate PAH-degrading bacteria. Stephen’s results indicate that long-term in situ biostimulation of contaminated soil can be an effective treatment strategy for former MGP sites.

North Carolina has over 30 highly contaminated sites that are in need of effective cleanup to protect public health and encourage redevelopment. Stephen’s project has the potential to be part of the solution to finding new and beneficial uses for North Carolina’s former manufactured gas plant sites.

Michael D. Aitken, Stephen’s dissertation advisor, said, “This work will have an impact on the cleanup of sites in North Carolina and others around the country, and it will also contribute fundamental knowledge to broader issues in bioremediation of soil contaminated by PAHs.”
More than one-quarter of Americans suffer from chronic pain at a cost of over $200 billion annually. In North Carolina alone, the incidence of chronic pain has doubled in the past decade, increasing personal suffering and disability while straining state resources. While numerous pain therapies exist, none are completely effective and many have undesirable side effects. Chronic pain can be extremely debilitating, affecting physical and mental well-being and profoundly diminishing quality of life.

Using “knock-out” mice, or mice in which selected genes were knocked out of the entire animal, and control mice, doctoral student Nathaniel Sowa identified two members of a class of proteins that are promising new targets for pain therapy. These proteins inhibit pain signals by creating pain-relieving compounds in the nervous system. He also made injectable forms of these proteins that relieve pain in animals with a duration that is eight times longer than the gold-standard analgesic morphine. Nathaniel’s research provides a novel and completely unexpected new approach for treating the chronic pain that afflicts an estimated 30% of North Carolinians.
Between 1999 and 2008, the percentage of North Carolina adults who are overweight has increased 5.5%, whereas the percentage of obese adults has increased 15.5%, remaining slightly higher than the national average. Thirteen percent of NC youth are obese, ranking 5th highest in the nation, and 16% are overweight. Being overweight or obese can lead to increases in the risk of certain types of cancer, heart disease, diabetes, and stroke.

Doctoral student Melanie Weed studied the mechanisms underlying obesity to determine potential targets for treatment. Using mouse models, she discovered a unique and unsuspected role of the epidermal growth factor receptor in regulating fat metabolism and obesity. Her results indicated that a pharmacological drug inhibitor of this receptor, currently used to treat various forms of cancer, reduced the amount of fat mass when fed a diet high in fat.

Melanie’s work has the potential to lead to revolutionary new approaches that can reduce weight gain and cancer risk as well as improve the overall health of the citizens of North Carolina.

Dissertation advisor David Threadgill stated, “Melanie’s work is of widespread importance because not only does it identify an entirely new biological mechanism controlling weight gain, but also because it indicates that existing drugs may have utility in reducing weight gain in addition to their anti-cancer activities.”

Intellectual Manhood at UNC, 1795-1861

In the early nineteenth century, northerners often viewed southern schools as crucibles of sectional loyalty and frequently characterized young students as dimwitted, brash and immoral. Since then, many historians have continued to view southern students and schools as teaching students to be southern rather than American.

Contrary to the widely-held stereotypes of a rowdy youth culture in the antebellum South, doctoral student Timothy Williams’ research on UNC students indicates that many young men learned to lead virtuous and publicly responsible lives during this time period. They viewed education as the key to advancing the best interests of North Carolina and the nation, and used their academic opportunities to develop mainstream American values—industry, temperance and discipline. He based his research on the University’s uniquely rich collections of letters, diaries, notebooks, compositions, speeches, and literary society records.

Tim’s research significantly adds to North Carolinians’ understanding of themselves and their state. It contributes nuance to a well-developed literature about power and privilege in the Old South by showing that the state accommodated styles of expression and culture not commonly associated with the Old South.
Previous Impact Award Winners

2009

Sunil K. Agarwal
Ventricular Premature Complexes: A Possible Harbinger of Stroke and Sudden Cardiac Death

Irving Coy Allen
Utilizing Genetic Models to Unravel Airway Constriction Associated with Asthma

Russell H. Behler
A Novel Use of Ultrasound for the Detection and Diagnosis of Atherosclerosis

Jennifer Carter
Breast Cancer and Obesity

Joshua Clark Davis
The Selling of Soul: African American Consumers, Music Businesses, and Community Empowerment in 1970s North Carolina

Lindsay DiStefano
ACL Injury Prevention Program for Youth Soccer Players

Kiyah Duffey
Examining the Causes and Consequences of Dietary Intake and Obesity

Laura Faulconer
Diffraction Enhanced Imaging: A Novel Form of X-Ray Imaging for Breast Cancer Detection and Diagnosis

Johanna Foster
Striving for Equity in Criminal Justice: An Analysis in the Variability of Bail Bonds in the Tenth Judicial District of North Carolina

Lindsay Haddix
Immigration and Crime in North Carolina: Beyond the Rhetoric

Jennifer Horney
Hurricane Evacuation Failure: The Role of Social Cohesion, Social Capital and Social Control

Mai N. Hubbard
The Effect of Mothers’ Employment and Child Care Decisions on the Body Mass Status of Young Children

Lance Johnson
The Role of the ApoE Protein and Cholesterol in Diabetes and Cardiovascular Disease

Linda K. Ko
Health Communication and Fruit and Vegetable Consumption

Leigh-Anne Krometis
Microbial Partitioning in Urban Stormwaters

Kun Lu
Assessing the Health Risk of External Exposure to Formaldehyde

Matthew Medlin
Signaling Pathways in the Regulation of Cardiovascular Disease

Anand Sharma
In-Migration of Retirees: Is North Carolina the New Florida?

Jacqueline Grace Wallenborn
Cardiovascular Effects of Zinc

Weimin Xi
Forest Response to Catastrophic Winds in the North Carolina Piedmont

2008

Janne Boone
Physical Activity and Obesity in Context: Complex Behaviors and Complex Lives

G. Rebecca Dobbs
The Indian Trading Path and Colonial Settlement Development in the NC Piedmont

Paul Fitchett
Why do we leave? An Examination of Social Studies Educators’ Professional Intentions

Anthony Fleg
Native Health Initiative: A Partnership to Address Health Inequities through Loving Service

Erin Fraher
The Allied Health Workforce Tracking Project

Morgan Jones
An Analysis of State High Risk Pools: Policies, Politics, and Financing

Amy Kalkbrenner
Geographic Influences on Autism Diagnosis: Accessibility of Health Services and Exposures to Hazardous Air Pollutants

Jason Kim
Innovative Biomedical Applications Using Metal-Chelate Nanoparticles

Martha King
Madison County Project

Kenneth Kolb
Identity and Emotion Management of Staff at a Domestic Violence and Sexual Assault Agency

Elizabeth Lanter
Emergent Literacy in Children with Autism Spectrum Disorders

Ying Li
Estimating Community Carbon Dioxide Reductions in Chapel Hill and Carrboro

Kim Manturuk
Assessing the Impact of Payday Lending Deauthorization on Moderate-Income Households in NC

Sandra McCoy
Understanding the Care-Seeking Behavior of HIV-Positive Persons in NC: Factors Associated with Presentation to Medical Care

Lauren Patterson
Spatiotemporal Analysis of Socio-economic Exposure to Assess Flood Policy Effectiveness in NC

Nicole Ramocki
Regulators of the Insulin-like Growth Factor System in Intestinal Cancer

Jennifer Renn
Measuring Style Shift: A Quantitative Analysis of African American English
Devon Risher
Mechanism and Consequence of the Hyper-methylater Phenotype in Human Breast Cancer

Allison Anders
Reducing Recidivism in Correctional Institutions: An Education Program that Works

Rupninder Sandhu
Sensitizing Breast Tumor Cells to Chemotherapeutics using Demethylating Agents

David Silkenat
Suicide, Divorce, and Debt in Civil War Era NC

Alexia Smith
Altered Immune Function in Obese Mice Infected with Influenza Virus-Mechanism for Immune Modulation

Patrick Smith
The Relationship between Functional Health Literacy and Adherence to Emergency Room Discharge Instructions among Spanish-Speaking Patients

John Staley
The Determinants of Firefighter Physical Fitness: An Inductive Inquiry into Firefighting Culture and Coronary Risk Salience

Nathan Stasko
Minimizing Heart Surgery Complications through the Synthesis and Characterization of Nitric Oxide Delivery Systems

Elizabeth Torrone
Late Diagnosis of HIV in Young Men in NC

Adam Walsh
The Impact of Supportive Housing on the Homeless of NC: Evaluation of Cost Effectiveness and Quality of Life

May Ling Becker
River-Estuary Water Flow Dynamics in the Cape Fear River Estuary, NC

Kimberly Cobb
NC Metabolic Newborn Screening: Loss to Follow-up, Physician Knowledge and Risk for Neonatal Tyrosinemia

Kaaren Haldeman
Expectant Fears and Racialized Reproduction: African American Women’s Lived Experiences of Pregnancy and Motherhood

Robert Faris
Social Networks and School Bullying

Jennifer Hillmann
Possible Link between Drinking and Depression

Sheritha P. Lee
Fighting Chronic Inflammation in Sickle Cell Disease by Controlling the CD40L Protein

Margarita Machado-Casas
Narrating Education of New Indigenous/Latino Transnational Communities in the South: Migration, Life and its Effects on Schools

Meghan M. McGlinn
Documenting the American South: How One Digital Library Provides Valuable Learning Resources to NC Social Studies Classes

Dorian Miller
Improving the Reading Comprehension of LD/ADHD Students through Reading Software

Lisa M. Paulin
A Critical Discourse Analysis of Latinos in English- and Spanish-language Newspapers of NC

Baker Perry
Northwest Flow Snowfall in the Southern Appalachians

Debra Risisky
Statutory Rape: Mandatory Reporting in the Title X Clinics of NC

Jennifer E. Weaver and Micah Weinberg
Prison Construction: An Economic Development Option for NC Counties?
Who we are…
The Graduate School of the University of North Carolina at Chapel Hill encompasses more than 80 graduate programs offering 66 doctoral and 102 master’s degrees.

What we do…
Support graduate students in every program across the Carolina campus, serving students from admission through graduation.

Provide more than $33.5 million each year to graduate students for fellowships, tuition support, travel awards, and research supplements.

Provide services to all graduate students, including seminars and classes in teaching, leadership, communication, grant writing, and other professional development.

Promote interdisciplinary education to prepare graduate students to lead in a complex, changing world.