2017 UNCW fall student research and creativity showcase

Display: November 20th and 21st
Reception: Monday, November 20th 4-6pm Warwick Ballroom
Welcome to the 5th Annual UNCW Fall Student Research and Creative Scholarship Showcase

Sponsored by UNC Wilmington’s Center for the Support of Undergraduate Research and Fellowships (CSURF), the Honors College, Graduate School, Office of Undergraduate Studies, ETEAL, Academic Affairs, and Randall Library, the posters represent important discoveries in the arts, sciences, humanities, and professional areas. We are pleased to present both graduate and undergraduate research, plus several examples of graduate and undergraduate students working together with a faculty mentor.

Viewers will note special badges on select posters indicating that the authors are being recognized for special achievements. Among them are: Summer or Spring Undergraduate Research and Creativity Awards, competitive CSURF Undergraduate Fellowships, receiving CSURF Travel Awards or Supplies Grants, or representing UNCW in the SNCURCS and CAA conferences. Look for these badges on the posters:

We are also highlighting project topics that have connections with the environment, global issues, health-issues, and service learning/community outreach.

Several undergraduate students will be recognized as UNCW Undergraduate Research Scholars and Distinguished Scholars because of their extended record of involvement in undergraduate research/creative scholarship on and off campus.

Enjoy the showcase!

Honors College/CSURF
Director Kate Bruce, Assistant Director-CSURF Nathan Grove, and Associate Director Jennifer Horan

UNCW Graduate School
Dean Ron Vetter and Nancy Holland

Undergraduate Studies
Dean Paul Townend

ETEAL
Director Jess Boersma and Robert Hicks

Special thanks to:
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Randall Library-John Crawford
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CSURF Graduate Assistants-Katie Dyer, Erika Winnie, Tiffany Kronenwetter, Nicole Westrick
CSURF Faculty Advisory Board
Honors Office Assistants
Honors College staff Peggy Styes and Morgan Alexander
Welcome to the Student Research and Creativity Showcase.

Research and scholarship were once considered the purview of faculty and doctoral students. But the experiences and accomplishments featured in this showcase show us the potential for both undergraduate and graduate students to conduct faculty-mentored research and creative scholarly activity.

This Showcase, organized each semester by the Honors College in collaboration with Undergraduate Studies, the Graduate School, ETEAL, and the Randall Library, puts on display the work of our student researchers, work which is often accomplished out of public view in laboratories, libraries, marshes, fields, etc.

These student researchers know the importance of striving for excellence and making their education the foundation for their future.

While we hope that all students take advantage of the opportunity to engage in interesting and meaningful research, the gifts and goals of students represented here have afforded them unique opportunities to work with professionals on and off campus to really discover, analyze, synthesize and advance knowledge in their chosen fields.

My congratulations to the students on their current achievement. My hope is that their work will inspire other students and that the tradition of meaningful faculty-mentored student research will continue as a hallmark of a UNCW education.

Marilyn A. Sheerer
Provost and Vice Chancellor for Academic Affairs
ABSTRACTS OF RESEARCH/CREATIVE SCHOLARSHIP ON DIGITAL AND POSTER DISPLAY

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ALPHABETICAL LISTING BY PRIMARY AUTHOR
THE DISCOVERY OF ANTIMICROBIAL COMPOUNDS ISOLATED FROM BACTERIA IN SEDIMENTS OF THE
CAPE FEAR RIVER

The discovery of antibiotic metabolites from marine resources has proven to be a novel source of antibiotics used to treat bacterial infections. In this study, soil samples were taken from islands in the Cape Fear River, diluted and cultured on Marine 2216 and ISP-2 media. After culturing, samples were tested for antimicrobial activity via a TSB overlay inoculated with \textit{S. epidermidis}. Isolate S5KI-3 (determined to be Lysinibacillus through 16S sequencing and a Biolog Assay) showed inhibition against \textit{Acinetobacter calcoaceticus}, a gram-negative ESKAPE pathogen surrogate. S5KI-3 was cultured in broth and ethyl acetate extraction was used to concentrate the cell-free antibiotic. Using disk diffusion, the extracted antibiotic was tested against more ESKAPE pathogens. The production of biologically active compounds from bacteria found in local marine sediments is a good indicator of the potential marine organisms and can contribute to the need for novel antibiotics.

MODELING DISPLACEMENT DUE TO NATURAL DISASTERS USING DIFFERENTIAL EQUATIONS

This research explores the population displaced due to natural disasters, specifically hurricanes. The population data concentrated on New Orleans and, applied with differential equations, allows the creation of mathematical models that reveals the migration trends caused by the hurricane. The focus of the model was on Hurricane Katrina because of the large amount of data available on the hurricane and the population that was affected by it. Creating a model of varying carrying capacity, by using systems of non-linear ordinary differential equations, changes in population dynamics can be clearly seen. The interpreted mathematical models and refined assumptions through data collection provide scientific evidence in large-scale conclusions of population displacement. These conclusions, along with numerical simulations, lead to predictions about pattern of population displacement, impacts to the population in the surrounding areas, and the effect of government initiatives and community support to the future population growth of the natural disaster area.
Poster #3

Primary Author: Jade Apostolico
Co-authors: Phillip Tippett
School/College: College of Health and Human Services
Department/School: Social Work
Faculty Supervisor: Jacquelyn Lee
Health
SURCA PROJECT

MINDFULNESS IN HIGHER EDUCATION: THE POWER OF PRESENCE FROM THE CLASSROOM TO THE COMMUNITY

A promising but underdeveloped area of research, many small-scale studies suggest a myriad of ways that mindfulness can benefit the individual and society. Inclusive of a review of current literature, this project aims to outline the benefits of mindfulness practice to higher education in relation to the learning process, students, instructors, and university culture. Broader implications for society are discussed.

Poster #48

Primary Author: James Bailey
Co-author: Dennis Kinuthia
School/College: College of Arts and Sciences
Department/School: Mathematics and Statistics
Faculty Supervisor: Indranil Ghosh

APPLICATION OF CERTAIN BIVARIATE COPULAS IN MODELING INSURANCE DATA

Copula is a useful tool for constructing bivariate and/or multivariate distributions. A copula is a multivariate distribution function whose marginals are uniform on [0, 1] [see Sklar (1959), Nelsen (2006) for further details]. It couples, or links, the marginal distributions to their joint distribution. In order to obtain a bivariate/multivariate distribution function, one needs to simply combine two (in the bivariate case) and/or several marginal distribution functions with any copula function. In this project, we will demonstrate the applicability of bivariate copulas in modeling several real life data sets appearing in the insurance domain. We will use some packages in R statistical programming to fit such data sets and will briefly discuss on several types of dependence structures.
MATHEMATICAL ANALYSIS OF EUROPEAN STARLING POPULATION CONTROL AND ECONOMIC IMPACTS IN NORTH CAROLINA

The *Sturnus vulgaris*, otherwise known as the European Starling, is an invasive bird species introduced to North America in the early 1890's. Since then, the species has spread rapidly across the continent due to its ability to adapt quickly to a new environment, and has become both an environmental and economic hazard in the United States. In order to understand and control the population, the trend in population dynamics are studied and fitted into a logistic model to estimate the species' population characteristics and limit. Afterwards, the economic impacts of the species are estimated in order to determine the best cost-effective control method. Our purpose of conducting research on the European Starling is to learn about population trends and utilize this knowledge to predict future population numbers, and most importantly, find effective ways to manage the population's growth and cut back on economic losses in various industries.

ASSESSING MUSCULAR FATIGUE VIA SURFACE ELECTROMYOGRAPHY DURING DYNAMIC KNEE EXTENSIONS

Exercise to fatigue at different loads has been reported to elicit similar gains in strength and hypertrophy if exercise is taken to momentary muscle failure (MMF). The proposed mechanism is speculated to be due to variation in the activation patterns of the muscles involved. PURPOSE: To examine the effect of exercise at two different loads through surface electromyography (sEMG). METHODS: Thirty participants (Age = 21.7 ± 3.4 yrs; Height = 170.5 ± 8.3 cm; Body Mass = 69.9 ± 14.8 kg) conducted an initial 1-repetition maximum (1-RM) testing session followed by exercise to MMF in two separate sessions set at least 48 hours apart in a random order. Surface electromyography signals were collected during dynamic knee extensions to fatigue at a load of 40% and 70% 1-RM, respectively, from the Vastus Medialis of both the dominant and non-dominant leg. For both conditions, random intercept and slope models were the best fitting. RESULTS: There were significant linear increases in amplitude with an increase in repetitions for both conditions. The slope for the 70% 1-RM condition was greater than the 40% 1-RM condition. CONCLUSIONS: These results suggest that the amplitude varies directly with number of repetitions completed and at the 70%1-RM condition the amplitude increases were greater. The absolute relative average amplitude of the 70%1-RM condition was also higher indicating greater muscle activation as inferred from sEMG activity.
THE METHODS OF THE COLLEGE ALCOHOL STUDY IN THE TRAUMA & RESILIENCE LABORATORY

In the College Alcohol Study conducted in the UNCW Trauma & Resilience Laboratory in the Department of Psychology, the overall goal of this IRB approved research is to understand how difficult events in life and choices about alcohol may impact how the brain functions. Following the informed consent process, several standardized questionnaires are administered to college-aged participants in addition to the completion of two cognitive functioning tasks while undergoing an electroencephalogram (EEG) to record brain function. This research is not funded, and participants do not receive any personal or financial gain from participation in the study; two research credits in the Department of Psychology are given to those who complete both the surveys and the EEG. By better understanding the ways in which brain and cognitive function may change, the Trauma & Resilience Lab hopes to find ways to help college students make more effective choices that decrease high risk alcohol use and traumatic experiences.

THE PROCESS OF GENTRIFICATION IN THE DOWNTOWN WILMINGTON AREA SINCE 2000

Gentrification is the process of revitalizing and developing an urban area that results in the displacement of low-income residents. We seek to examine the spread of gentrification in the downtown Wilmington area, as well as approaches to preventing this negative outcome through policy, resources, and land use planning methods. We used census data from 2000 to 2010 to examine income-related data in ArcMap to show the process of development-related demographic change in the downtown Wilmington area, within the boundaries of Dawson Street to the south and Martin Luther King Jr. Parkway to the north, and Water Street to the west and 17th Street to the east. Select parcel records from the tax office of New Hanover County are also used to explore change in property values of specific areas of interest over the course of time.
**Poster #9**  
**Primary Author:** Sarah Brewster  
**School/College:** College of Arts and Sciences  
**Department/School:** Biology and Marine Biology  
**Faculty Supervisor:** R. Christopher Chambers, NOAA Hollings Internship supervisor  
**Environment**

**EXPERIMENTAL ASSESSMENT OF FLUCTUATING VERSUS FIXED CO2 ENVIRONMENTS ON THE EARLY LIFE STAGES OF ATLANTIC SILVERSIDE (MENIDIA MENIDIA)**

Ocean acidification threatens marine ecosystems and inshore habitats exhibit wide seasonal and daily fluctuations in carbonate chemistry, commonly showing an inverse correlation between tidal level and carbon dioxide (CO₂). We experimentally assessed effects of tidal CO₂ fluctuations on early life stages of Atlantic silverside (Menidia menidia) utilizing 14 discrete CO₂ levels provided from a high-frequency CO₂ system (HFCO₂). Regime 1 implemented CO₂ fluctuations of 6 varying magnitudes around a common, constant level. Regime 2 implemented fluctuations of similar magnitude around five different CO₂ mid-points. We simulated tidal changes by moving egg/larval containers between target CO₂ levels every 12 hours from fertilization until hatching. Fitness diminished with increasing CO₂ fluctuations. Intermediate CO₂ levels produced high fitness but there were no differences in responses between constant and fluctuating conditions nor any interaction between the two factors. This protocol proved effective for testing realistic, high-frequency variations in CO₂ typical of inshore habitats.

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**Poster #10**  
**Primary Author:** David Brown  
**Co-author:** Ashlyn Keidel  
**School/College:** College of Arts and Sciences  
**Department/School:** Biology and Marine Biology  
**Faculty Supervisor:** Arthur Frampton  
**Environment**

**VIRUS HUNTING IN ASCIDIANS (SEA SQUIRTS)**

Ascidians (Asidiacea; Tunicata; Chordata), commonly referred to as 'sea squirts', are marine filter-feeder invertebrates with a worldwide distribution. A recent metatranscriptome analysis by the iMESA Lab at the University of North Carolina Wilmington revealed that some of the sequences found in the colonial ascidian Distaplia bermudensis corresponded to a variety of viruses including megalocytiviruses. Megalocytiviruses are double strand DNA viruses that are commonly found in many marine organisms, especially fish. We conducted PCR on template DNA obtained from multiple ascidian species using specific primers. The DNA was then cloned into a plasmid vector containing a gene for ampicillin resistance and transformed into Escherichia coli. The transformed E. coli were grown on ampicillin positive plates, and the resulting ampicillin-resistant colonies were picked and the plasmid DNA isolated. If any of these DNA sequences can be unambiguously matched to megalocytivirus DNA, our study will be the first one reporting megalocytivirus in ascidians.
Poster #11
Primary Author: Jessica Carlton                                                                 Undergraduate Student
School/College: College of Arts and Sciences
Department/School: Biology and Marine Biology, Public and International Affairs
Faculty Supervisor: Elizabeth Darrow

Environment

EFFECTS OF NEW OYSTER CULTIVATION ON SEDIMENT CHARACTERISTICS WITHIN MASONBORO ISLAND, NC

Natural oyster populations provide a variety of ecosystem services, including habitat, erosion control, current modification, improvements to water quality and nutrient cycling. The addition of shellfish farms to shallow coastal areas has the potential to change habitat quality and resource availability for surrounding estuarine communities, largely through changes in nutrient cycling and deposition rates. Oysters remove nitrogen-containing particles from the water column and move them to the sediments through their biodeposits, and can cause an accumulation of ammonium and sulfides. Increased ammonium and sulfides can, in high quantities, be toxic for benthic organisms and contribute to the shutdown of chemical reactions. Sediment characteristics inside and outside oyster farms was assessed and compared to uncultivated areas within the NCNERR at Masonboro Island, NC. Porewater sulfide, extractable ammonium, and sediment organic content were assessed before and after the addition of oyster farms for changes including potential sediment hypoxia, denitrification, and microalgal production.

Poster #5
Primary Author: Samantha Carroll                                                                 Undergraduate Student
School/College: College of Health and Human Services
Department/School: Recreation Therapy
Faculty Supervisor: Candy Ashton

Environment

ABILITY GARDEN NEEDS ASSESSMENT

The Ability Garden is the Therapeutic Horticulture program of the New Hanover County Arboretum. As part of the Ability Garden's 2017-2020 Strategic Plan, it is engaging in a community wide needs assessment to determine what adapted horticulture programs and services are needed/wanted by citizens with disabilities of New Hanover County. Both in-person interviews and an online survey were utilized to collect data from stakeholders, such as special education, and assisted living and long-term care facilities, health care facilities, and programs for youth-at-risk. Nine agencies were contacted via phone, sixteen agreed to be interviewed, one agreed to complete the on-line survey, one declined to participate, and fourteen never responded to the requests. Results indicated the stakeholders felt that therapeutic horticulture programs could increase their clients'/students'/residents' social skills, job and academic skills, quality of life, and independence and community integration. Most wanted services brought to their facilities. The community-based agencies that served adults requested information to give their clients about programs offered at the Ability Garden.
DON'T JUDGE A FISH BY ITS ABILITY TO CLIMB A TREE: DIFFERENCES IN PERFORMANCE ON THE TMT AND THE CTT BETWEEN RUSSIAN AND AMERICAN POPULATIONS

The majority of neuropsychological assessments have not been developed or validated for use with various cultures. Yet, researchers have found that cultural variables affect neuropsychological performance. In our study, Russian and American populations were administered various tests to examine differences in performance. Two being the TMT and CTT, which are commonly administered in clinical and forensic settings and thought to be 'culture-fair' because they are nonverbal. They are timed tests in which time of completion, and errors made, determines an individual's level of cognitive functioning. Researchers have challenged the use of timed tests for cross-cultural use, because perception of time varies across different cultures. In both tests, we found significant differences in completion time between Russians and Americans, but no significant difference in errors made. The use of assessments, which have not been validated for cross cultural use is not scientifically sound and serious diagnostic errors could be made.

WILL YOUR BUSINESS SURVIVE? APPLYING DATA MINING TECHNIQUES TO BUSINESS GROWTH

Will Your Business Survive? Applying Data Mining Techniques to Business Growth. Predicting annual business growth and performance can be a complicated matter, but by using data mining techniques to identify important variables it is possible. INC.com's 5000 fastest growing private business list (percent growth between 2014 and 2017) was used for the analysis of the effects of employee number, raw revenue, and type of industry on business growth. Classification and regression methods (i.e., clustering and polynomial regression models) were used on these factors and found that annual business growth could be predicted above chance. Creating models that can predict growth will allow for more accurate economic analyses and in business practices in a rapidly-changing world.
INVESTIGATION OF REFERENCE GENES IN Flavobacterium johnsoniae FOR QUANTITATIVE PCR

*Flavobacterium johnsoniae* is in the phylum Bacteriodetes and is used as a model organism to investigate biofilm formation and gliding motility. The gliding motility system is unique for bacteria in this phylum and is still little understood. It is driven by cell surface adhesins that attach to biotic and abiotic surfaces which aid their movement. These adhesins can also contribute to biofilm formation. Few gene expression analysis studies have been conducted for bacteria in this phylum and to our knowledge none have been conducted for *F. johnsoniae*. A gene analysis study for *F. johnsoniae* will aid our understanding of the mechanisms of biofilm formation and its mode of movement. Selection of candidate reference genes were made based on previously published expression studies including studies conducted on members of other phyla, and the minimum bacterial gene set. Candidate genes were chosen from various cell metabolic pathways, including DNA metabolism (dnaG, recA,), RNA metabolism (asnC, glnA, rplE, fusA, 16s rRNA), and energetic and intermediary metabolism (pgk, gmk, glyA). Overall, ten candidate reference genes were selected and gene-specific primers were designed for each with a product length of approximately 100 bp. PCR was performed for each gene and products were cloned into the TOPO TA pCR 4.0 vector. After transfection into *E. coli* the respective plasmids were extracted, confirmed, and quantified. This process was also applied to two target genes involved in motility (sprB) and Type IX secretion (gldM). Standard curves were generated for each gene to confirm efficiency, and primer sets will be used in RT-qPCR to validate reference genes and compare expression of target genes.

SEASONING BACTERIA: COMBINATIONS OF HERBS, SPICES, AND THEIR MAJOR CONSTITUENTS WORKING SYNERGISTICALLY AGAINST ESKAPE PATHOGENS

Spices are used in food preservation, indicating that they have capabilities to inhibit microbial growth. Different combinations of herbs and spices are being tested for their abilities to inhibit growth of ESKAPE pathogens. Preliminary research shows that these plant extracts can be used instead of, and in combination with, antibiotics. Methanol extracts of cinnamon and oregano, individually, showed inhibition of *Staphylococcus aureus* and *S. epidermidis*. In combination, oregano and cinnamon methanol extracts caused inhibition of *Enterococcus faecalis*. While streptomycin was unable to inhibit growth of *K. pneumoniae* on its own, addition of oregano extract to the antibiotic produced an amplified inhibition zone from what was produced by oregano alone. Other spices will be researched and tested through microdilution and disk diffusion assays. This research will assess the potential of spices and herbs as alternatives or enhancers to antibiotics to fight the growing threat of antibiotic resistance.
DISCOVERY OF ANTIBIOTIC PRODUCING MICROORGANISMS IN WRIGHTSVILLE BEACH SALT MARSH

The purpose of this project is to isolate and identify antibiotic producing bacteria in the salt marsh located in Wrightsville Beach, North Carolina. This research is of high importance because it could lead to the development of new antibiotics to combat the growing resistance to previously discovered antibiotics. To get the most favorable results, and properly study bacteria from this environment, it was necessary to alter the incubation temperature and agar media to mimic the natural setting from which it was collected. Preliminary data and research suggested that the greatest microbe diversity was found using trypticase soy agar (TSA), so it was the primary medium used in this research project. To identify antibiotic producers, TSA cultures of microbes from salt marsh samples were overlayed with *Staphylococcus aureus* and *Pseudomonas aeruginosa*. From the three original overlay plates, there were three zones of inhibition, two being from the *P. aeruginosa* overlay. Once pure cultures of each microorganism were established, cross streaks were performed with the ESKAPE pathogens. One of the microbes from the *P. aeruginosa* overlay showed strong inhibition against multiple pathogens, so the 16S rRNA gene was amplified by PCR and sent for sequencing for identification. To continue from here, isolation of the antibiotic compound is a necessary step to identifying its properties.

EFFECTS OF CAFFEINE ON RATES OF OXIDATION OF FATTY ACIDS, GLUCOSE, AND GLUTAMINE IN ISOLATED MOUSE MUSCLE CELLS

I tested the hypothesis that caffeine enhances fat utilization in muscle cells. I examined caffeine's effects on rates of oxidation of fatty acids, and compared this to previous data examining the effects of caffeine on glucose and glutamine oxidation in C2C12 mouse skeletal muscle cells. Myocytes were seeded in microplate wells and induced to differentiate into myotubes, which are precursors to skeletal muscle. Myotubes were treated with 250 µM oleate for 24 hours and then 250 µM oleate and 0.5 mM caffeine for an additional 24 hours. The second group of cells were treated as above, but were also treated with 4 µM bafilomycin, which inhibits lysosome function, for the final 24 hours. I used a Seahorse XFp Metabolic Flux Analyzer, to measure the basal oxygen consumption rate (OCR), as well as the OCR in the presence of specific inhibitors for fatty acid, glucose and glutamine oxidation. The results suggest that low doses of caffeine may not affect skeletal muscle mitochondrial fuel utilization, but that low doses of bafilomycin decrease mitochondrial fuel utilization.

The Southwest Fisheries Science Center has conducted a yearly midwater trawl survey off the California coast since 1983 to sample juvenile rockfish and other associated epipelagic micronekton. In recent years, the King-of-the-Salmon ribbonfish, *Trachipterus altivelis* has been caught in higher abundances, possibly in response to unusual ocean conditions or due to higher abundances of gelatinous organisms. This species is a strikingly unique but poorly understood fish. The aim of the study is to improve our understanding of the life history and ecosystem interactions of King-of-the-Salmon through analysis of historical catches and species associations, daily and annual otolith aging, and examination of feeding habits through the analysis of stomach contents and the development of a jaw protrusion model. This is one of the first studies to look in depth at the ecological role of this fish, which is important because they may be affected by changing oceans in the future.

HOST SOCIETY IMMIGRANT RECEPTION: EXPERIENCES OF IMMIGRANTS WITHIN THE UNITED STATES BASED UPON SKIN PIGMENTATION

The research proposed is an attempt to study a potential correlation between immigrant experiences within the United States in relation to physical attributes, specifically skin pigmentation. This study is relatively common among those within the field and many theories are associated with immigration and host society reception. While much literature exists studying this particular topic, small subsets within the grand study do exist. The purpose of this research is to identify these specific groups and analyze them with the knowledge of other research projects conducted by sociologists within the field. Such theories that will be explored include assimilation theory, pluralism, and transnationalism. Due to the current climate associated with immigration, particularly in the United States, historical and theoretical information will be cited and applied in order to analyze how this climate has impacted the host society's suspected view of immigrants depending upon skin pigmentation.
INCREMENTING NON-MATCHING-TO-SAMPLE IN RATS: EFFECTS OF DIZOCILPINE

We have developed an operant version of the odor span task, an incrementing non-match to sample (INMTS) procedure used to study within-session remembering in rodents. Six rats were trained on a go, no-go procedure to make nose-poke responses to olfactory stimuli. In each session, responses to odorants were reinforced on an FI 5-s schedule the first time they were presented, but not on subsequent presentations. Rats rapidly acquired the task as indicated by responding at high rates to new stimuli and much lower rates to repeated stimuli. Accuracy was lower when the number of stimuli to remember was high and following the insertion of a mid-session distractor task. The NMDA antagonist dizocilpine (MK-801) produced dose dependent increases in response rates and reduced discrimination ratios on both the INMTS task as well as a simple discrimination.

IT'S COMPLICATED: THE SPATIAL RELATIONSHIP BETWEEN WEALTH AND FLOOD RISK

Devastating floods caused by Hurricane Harvey reignited debate about the governance of the National Flood Insurance Program (NFIP). Political interests criticize the NFIP's cost decision making process for favoring wealthy homeowners in high-flood risk areas at the expense of the poor. However, the criticism contrasts with early conceptions depicting the poor at higher risk of flooding. Our research uses geospatial analysis techniques to measure correlations between US Census demographic variables and flood risk defined in the NFIP flood maps. A multi-dimensional approach is being used to measure wealth in the coterminous US over the past 50 years. Preliminary results indicate geographic patterns of wealth have changed over time where it was once concentrated in specific cities; it is now more widespread reflecting broad urban development trends. Results render popular criticism of the NFIP as overly simplistic. The work informs decision making towards meeting NFIP's mandate of, “distributing burdens equitably.”
Environment
THE INTEGRATION OF OPTICAL AND MICROWAVE SPACE DATA TO LOCATE POTENTIAL SITES FOR GROUNDWATER EXPLORATION IN EASTERN SUDAN

Finding areas in Sudan with groundwater recharge are predicted by analyzing the hydrology of drainage basins during precipitation events. Physiographic characteristic information was used to create a hydrological model employed by drainage networks delineated from Shuttle Radar Topography Mission (SRTM) data, surface cover distributions from satellite imagery, and rainfall estimates from Tropical Rainfall Measuring Mission (TRMM). Created using SRTM for the Eastern portion of Sudan, flow accumulation, flow direction, stream order, and watersheds illustrate where precipitation accumulates. Results show a watershed stretches from the Red Sea Hills to the Nile River. To determine the possibility of an aquifer, multispectral and thermal imagery were used to survey water accumulation below the watershed after periods of rainfall, showing overflows from minor tributary systems. Synthetic Aperture Radar data is used to gain insight of general groundwater accumulation in the area to determine if this aquifer could be a potential site to drill wells.

Health
PREDICTING THE CONDITIONS FOR CRYSTALLIZATION OF MONOCLONAL ANTIBODIES

Crystallization of IgG antibodies has important applications in the fields of structural biology, biotechnology, and biopharmaceutics. Current trial-and-error protein crystallization screenings are often time consuming and the success is not guaranteed. It is even more challenging to crystallize a protein in selected buffer of interest. Based on a simple experiment and the fundamental knowledge of protein crystallization, we present a method to predict the solubility of IgG antibodies at various temperature in any given buffer.
Poster #30  
Primary Author: Tyler Evangelous  
Undergraduate Student  
Co-authors: Rhiannon P. Flynn and Harrison R. Wooten  
School/College: College of Arts and Sciences  
Department/School: Chemistry and Biochemistry  
Faculty Supervisor: Ying Wang and Ann Pabst  
Health  
SURCA PROJECT  
A STUDY ON 'SUPER MUSCLES' OF WHALES AND DOLPHINS: THE MOLECULAR BASIS FOR THE DEEP-DIVING CAPABILITY OF CETACEA  
Marine mammals can dive for hours at a time without surfacing for air because of the high concentration of an oxygen storage protein called myoglobin in their muscles. The concentration of myoglobin in the muscles of marine mammals is approximately one hundred times higher than that of terrestrial mammals. To avoid protein aggregation, the solubility of myoglobin in marine mammals must be extraordinarily high. We developed a novel biophysical assay to purify and compare myoglobin solubility in fresh pig (Sus scrofa domesticus) tenderloin and beaked whale (Ziphius cavirostris) back muscle. The experimental results presented here can lead to development of a super soluble oxygen storage protein that can be used in healthcare or biotechnology applications.

Poster #31  
Primary Author: Tyler Evangelous  
Undergraduate Student  
Co-authors: Rhiannon P. Flynn, Harrison R. Wooten and James J. Lewis  
School/College: College of Arts and Sciences  
Department/School: Chemistry and Biochemistry  
Faculty Supervisors: Ying Wang and Shu-Yu Liao  
Health  
AN IN VITRO MODEL FOR A PHARMACEUTICAL INTERVENTION FOR CONGENITAL CATARACTS  
The research explores an in vitro model to study hereditary cataracts and possible pharmaceutical interventions to prevent/reverse cataract formation in the human eye lens. The hereditary mutant protein has substantially lower solubility than the native protein, which causes unwanted aggregation (i.e. cataracts) at physiological protein concentration. The native human eye lens protein and a hereditary mutant were produced recombinantly and were used for the in vitro model. The solubility line of both the native protein and the mutant were determined. A drug screening was performed to find a molecule that would increase the solubility of the mutant protein, therefore preventing protein aggregation. Two molecules, UNCW compound 1 and UNCW compound 2, were found to drastically increase the solubility of the mutant. Based on structure of these two compounds, we are currently developing new molecules that would be most effective for pharmaceutical intervention.
Poster #6
Primary Author: Sydney Fox                              Undergraduate Student
School/College: Watson College of Education
Department/School: Early Childhood, Elementary, Middle, Literacy and Special Education
Faculty Supervisors: Lisa Buchanan and Cara Ward

SURCA PROJECT

USING FILM AND HISTORY LABS TO TEACH TOPICS OF RACE AND CONSTITUTIONAL RIGHTS IN ELEMENTARY TEACHER EDUCATION

For this research, we looked at the use of film and history labs to study preservice teachers opinions and views of teaching race and constitutional rights in the classroom. We were able to examine these opinions and views through these two questions: What are elementary preservice teachers' beliefs about teaching topics of race and race relations in elementary grades? And what are elementary preservice teachers' beliefs about using documentary film and historical sources to teach local history?

Poster #51
Primary Author: John Frazier                              Undergraduate Student
Co-author: Eric Reeves
School/College: College of Arts and Sciences
Department/School: Mathematics and Statistics
Faculty Supervisor: Dijana Jakelic

CALCULATING PLATONIC SOLIDS ROTATION GROUPS WITH SYMMETRY

This paper’s background is established by reviewing some basic concepts from linear algebra and abstract algebra, including the orthogonal group, the special orthogonal groups, isometries, and symmetry groups. These group theory concepts are applied to geometry. In particular, one calculates the groups of rotations for all of the five platonic solids: the tetrahedron, the cube, the dodecahedron, the octahedron, and the icosahedron.
DIFFERENTIAL EFFECTS OF CONTINUOUS VERSUS INTERMITTENT EXERCISE ON MEMORY IN C57BL/6J MICE

Research demonstrates that exercise improves cognitive function in both human and animal models, despite differences in exercise schedules. Animal models typically follow a continuous schedule while humans follow an intermittent schedule with shorter durations of exercise. The present study, evaluated memory following different exercise schedules. Adult female C567BL/6J mice were assigned to exercise (2-hour access to running wheel) or control (no wheel access) groups and followed one of three schedules: continuous (C; 6 days/week, 28 days total), intermittent short (IS; 3 days/week, 14 days total), or intermittent long (IL; 3 days/week, 28 days total). The IL group was included to determine whether the schedule or total number of exercise days was important. Following exercise, memory was assessed using a contextual- and auditory-fear conditioning task. Results showed similar performance in the behavioral task across groups. Further research is needed to determine if increasing the length of exercise produces beneficial effects.
PREDICTING FIELD GOAL ACCURACY USING DATA MINING TECHNIQUES

In football, a field goal is a means of scoring points by kicking the football. We apply various data mining techniques to a set of 952 attempts with 8 variables to determine the probability of a successful field goal attempt. While distance is the most significant variable, we analyze the data to find less obvious factors that affect probability.

USING VERTEX COLORING TO EXPLORE AND SOLVE SUDOKU PUZZLES

Vertex-coloring is an assignment of colors to vertices such that no edge connects vertices of the same color. This is useful in applications such as map coloring and scheduling, among many others. One interesting application of vertex coloring is solving those difficult Sudoku puzzles that we try to wrap our brain around. In this research paper, we will explore some of the history of graph coloring, define terms needed for the project, and provide analysis of the chromatic number with theorems and proofs that help find bounds of the chromatic number for general graphs. A Greedy algorithm is then used to find the chromatic number of the 7-regular graph that is created by an unfilled Sudoku puzzle. Finally, we will explore theorems and methods of solving both 4X4 and 9X9 Sudoku puzzles.
Environment

THE ALLOCATION AND UTILIZATION OF OPEN SPACES IN DOWNTOWN WILMINGTON, NC

A comparative study was done on the previous and current comprehensive development plans within the boundaries of downtown Wilmington (5.2 sq mi) to show how the development of open spaces has changed in the past two decades. Open spaces are defined as an area of land without any residential, commercial, or industrial infrastructure. These areas are accessible to the public and include parks, gardens, pedestrian corridors, outdoor recreation, and public access facilities to the city's creeks, rivers, sounds, and estuaries. Integrated environmental planning for downtown Wilmington could be utilized in resemblance to those methods used in another river city such as Portland, Oregon. Through this comparison, our findings consisted of the environment land use design techniques and the goals the city of Wilmington did or did not achieve.

Health

THE USE OF SOIL EXTRACTION MEDIA IN CULTIVATING ANTIBIOTIC PRODUCING BACTERIA

Discovering new antibiotics is essential to overcoming the rising number of antibiotic-resistant infections. My goal is to refine and test a method of making culture media that is more effective for cultivating novel antibiotic producing bacteria. The media I am using is Soil Extraction Agar (SEA) and it is made using soil and water from the environment that culture samples come from. SEA is thought to be more nutritionally similar to bacteria's natural environment, which will hopefully promote the growth of previously unculturable bacteria. Using this method, three antibiotic producing species have been cultivated. These species have been examined using a Gram stain and are currently undergoing DNA isolation.
PRINCIPLES OF DEEP LEARNING

Recent advances in computing power have opened the door to Deep Learning. The concept of Deep Learning uses a series of mathematical algorithms built into a computer model that allow machines to learn on the fly, and recognize images, and detect natural language with accuracies previously not possible. The goal of this project is to outline key concepts found in Deep Neural Networks, such as Gradient Descent and Regularization, and create an example of the computing applications using the TensorFlow package found within the Python computer programming language.

GENETIC ASSESSMENT OF THE HYBRID ZONE BETWEEN THE MUMMICHOG AND GULF KILLIFISH

Hybrid zones provide opportunities to study speciation, competition, gene flow and selection. A hybrid zone between Fundulus heteroclitus and Fundulus grandis is located across an ~38 km stretch of coast near Flagler Beach, FL. We decided to look at the strength of the reproductive barriers, the survivorship of the hybrids and their reproductive abilities. Two different age cohorts of Fundulus spp., juveniles and adults, were collected in the summers 2015 and 2016. Using restriction fragment length polymorphisms in four different loci, we determined the genetic composition of the Flagler Beach population. The hybrid indices showed strong reproductive barriers between the two species. Hybrids are fertile since most individuals are F2 or backcrosses. There is also evidence for low survivorship in hybrids since recombinant genotypes are lacking in the adults but not the juveniles. Future studies are going to focus on determining why and how the hybrid zone is changing.
Poster #54
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Department/School: Mathematics and Statistics
Faculty Supervisor: Cuixian Chen

USING DATA CLASSIFICATION TECHNIQUES TO PREDICT INCOME

Our dataset includes over 31,000 observations from the U.S. Census, and the goal of this research is predicting whether an individual earns greater than or less than $50,000 per year based on demographic oriented predictors such as age, education level, and race. We compared various data mining procedures to determine the strongest methods for accurately predicting which income category (<=50K or >50K) a person should be classified as. R software was utilized to train, test, and cross validate our models and high performance computing (HPC) was necessary to speed up processing times for our extensive dataset. We considered k-fold and leave-one-out cross validation methods for Logistic Regression, LDA, QDA, KNN, Boosting, Random Forest, Bagging, and SVM classifiers. We also considered the benefits and drawbacks of each of these techniques when determining which classification method is superior for our project's mission of correctly classifying income as above or below $50,000.

Poster #72
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Health
SURCA PROJECT

ROLE OF IMMUNE RECEPTORS IN AGE RELATED COGNITIVE DECLINE AND NEUROINFLAMMATION IN ADULT AND AGED MICE

The immune system protects the body from illness by mounting an inflammatory response. However, when we age, our brains develop a low-grade chronic inflammation, which may contribute to cognitive decline and age-related diseases such as Alzheimer's. Investigating what causes this aging induced inflammation can possibly explain why it occurs and how to prevent it. Toll-like receptor 4 (TLR-4) activation is possibly involved in driving this inflammation with age. We tested whether the TLR-4 receptor is involved with age-related deficits in spatial memory by comparing wild-type C57 mice with TLR-4 knockout mice in the Morris water maze. If TLR-4 contributes to inflammation then mice without the receptor should show better memory. Results showed that the absence of TLR-4 enhanced spatial memory in aged females, but not males, indicating that TLR-4 activation may differ in males and females.
COLLABORATIONS BETWEEN PSYCHOLOGY AND NEUROBIOLOGY THAT LED TO PSYCHOLOGY'S FIRST NOBEL PRIZE

Roger Sperry's work that stemmed from physiological factors in animals to understanding the role of the human mind helped prove that psychology and neurobiology could work in collaboration rather than conflict. Sperry's most famous work is the split-brain studies, which consisted of cutting the corpus callosum to eliminate seizures in individuals. The split-brain research altered the physiological functions in humans and measured whether or not adaptations occurred following these changes. Sperry aided in building the bridge between psychology and neurobiology by following the surgeries with experiments testing the functions of the individuals with split-brains. These psychological tests lead to the discovery of independent functions of the right and left hemispheres. His work relied heavily on the knowledge of neurobiology and psychology and it can be argued that both fields contributed equally to the discoveries he made as well as the Nobel Prize.

USE OF VL55 MEDIUM TO CULTURE ANTIBIOTIC-PRODUCING BACTERIA FROM SOIL SAMPLES

One potential source for antibiotic discovery is soil bacteria. However, a reoccurring problem with discovery of antibiotic-producing bacteria is the ability to culture the species in lab. In order to address this issue, a nontraditional defined medium, VL55, was used along with various carbon sources to culture new or unique bacteria. The samples used in the experiment were collected from the UNCW Longleaf Pine Forest. After a sufficient amount of bacterial growth appeared, the plates were tested for antibiotic activity amongst the colonies by using a test organism, *S. aureus*. Evidence of antibiotic activity, such as a zone of inhibition, led to further testing of antibiotic activity against the ESKAPE pathogens. Organisms that produced zones of inhibition or showed unique colony morphology were identified by 16S rDNA sequencing. Characterization and identification of species will be conducted to evaluate the use of VL55 medium for isolating novel antibiotic-producing bacteria from soil.
**Poster #7**

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**Faculty Supervisor:** Susan Catapano

**SURCA PROJECT**

**EXPANDING THE KNOWLEDGE OF LIBRARIANS TO SUPPORT ENGLISH LANGUAGE LEARNERS IN BELIZE**

This project involves identifying materials and resources that community librarians in Belize can use to support students and families who are learning English as a Second Language (ESL). Many children and families are coming into Belize from surrounding Spanish-speaking countries, e.g. Mexico, Guatemala, and Honduras. Librarians are faced with the challenge of supporting and teaching these students who are trying to learn English. The goal of this project is to help support the librarians in Belize by creating a website that includes resources, lesson plans, activities, and games to be used when working with ESL students. The first phase of the project began with a survey that was sent out to librarians across the country of Belize. Our goal of this survey was to identify the needs of Belizean librarians and what kind of materials they would like to see from the website. The second phase of the project was to travel to San Pedro, Belize to offer programming for the children during the community library's annual summer camp and to work with the town librarian on identifying how to support local ESL students. The final phase of the project was to create and launch the website for librarians to use. This will allow librarians in Belize to feel better prepared to work with newcomer students and to support and educate students learning English as a second language.

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**Poster #55**

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**Co-authors:** Sean Losco and Nicole Prosser  
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**Faculty Supervisors:** Zhuan Ye and Jeffrey Brown

**DISTRIBUTION OF ZEROS IN VARIOUS POLYNOMIALS**

Littlewood polynomial is a polynomial where each coefficient, is equal to 1 or -1. We are able to graphically represent the zeros of the polynomial in a visually stimulating anomaly. The objective of this study is to define a generalized Littlewood Polynomial, and graphically represent its zero set and analyze the graph of the set. We extended the Littlewood polynomial to polynomials with coefficients -1,0,1 and used Python to produce the roots of the extension of the Littlewood polynomial, Matlab to produce graphs and also take an axiomatic approach in order to evaluate their components in the complex plane.
Poster #32

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SURCA PROJECT

DEVELOPMENT OF AN ARDUINO-BASED LED INSTRUMENT FOR EDUCATION

UV/vis spectrophotometers are used to detect the concentrations of molecules in solutions, but these instruments can cost thousands of dollars. Many high schools do not have these expensive spectrophotometers. The purpose of this project was to begin building a low-cost UV/vis instrument for high school chemistry. The instrument has LEDs as light sources and light detectors, a sample holder, and an Arduino UNO microcontroller. Instrument component housing was designed and 3D printed on a RepRap Guru Prusa i3 V2 that we assembled from a kit. LED emission spectra were measured with a spectrograph, and light detection spectra were measured with a Cary 100 UV/vis spectrophotometer. Various LED colors were tested to determine their maximum emission and maximum light detection wavelengths. Solutions of methylene blue were prepared and tested using the low-cost instrument. A linear calibration curve was generated from these absorbance measurements.

Poster #37

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Environment

AGRICULTURAL IMPACTS ON WATER QUALITY IN THE LOWER CAPE FEAR RIVER BASIN: A MULTI-DISCIPLINARY APPROACH USING STATISTICAL DATA MINING AND GEOGRAPHIC INFORMATION SYSTEMS

The Lower Cape Fear River Program, a coalition of NDEPS permit-holders, non-profit and government organizations, and University of North Carolina Wilmington, has conducted monthly monitoring of water quality in the Lower Cape Fear River Basin since 1995. Our study employed multiple statistical learning data mining and geospatial methods to examine trends in this large dataset. We generated three land use variables (CAFO density, swine density, and percent agriculture) using geographic information systems, and tested model ability to predict water quality variable values as a response to land use for 13 stations at or near watershed outlets. These results are not meant to be definitive, but should instead be used as a basis for refining the statistical models which have the highest accuracy in terms of variable prediction. Additionally, the results give insight into the relative importance of each land use variable's impact on a given water quality variable.
MODELING POTENTIAL STREAM POLLUTION RISK NEAR CONCENTRATED ANIMAL FEEDING OPERATIONS, LOWER CAPE FEAR RIVER BASIN

The Cape Fear River Basin has some of the highest densities of concentrated animal feeding operations (CAFOs) in the United States. My study uses a Soil and Water Assessment Tool and long-term water quality data to identify sub-basins with the greatest potential for discharging pollution to streams. My objectives are: 1) classify sub-watersheds into hydrologic response units (HRUs) based on land use type, physical landscape characteristics, and response to rainfall, and 2) model the relationship between HRUs, CAFO density, and water-table depth to determine areas most likely to discharge pollution into streams during a rainfall event.

RICH-TO-LEAN TRANSITIONS: SEPARATE AND COMBINED EFFECTS OF WORK REQUIREMENT AND REINFORCEMENT AMOUNT

Under fixed-ratio (FR) schedules, a set amount of responses are required in order to receive reinforcement. It has been shown that after obtaining the reinforcement, and before beginning the next work requirement, it is typical to observe a pause in responding (post-reinforcement pause). When transitioning from favorable to unfavorable conditions (i.e., rich-to-lean), these pauses are extended. Several methods have been used to manipulate the favorability of the conditions. For example, a smaller work requirement is more favorable than a larger work requirement and a larger reinforcer is more favorable than a smaller reinforcer. The present study examined the individual and the combined effects of work requirement and reinforcer amount in rich-to-lean transitions. Rats responded under multiple FR FR schedules. The ratios differed with respect to work requirement and/or reinforcer amount. These two variables were examined separately and in combination. Both variables affected the post-reinforcement pause and they did so additively.
The influence of parental psychological control, gender, and social pressure on the sexual behaviors of Mexican adolescents

Previous research has linked parental psychological control to sexual risk-taking among adolescents (Kincaid, Jones, Sterrett, & McKee., 2012). This study examined whether parental psychological control was associated with the normative sexual behaviors of Mexican adolescents. This study also examined adolescents’ feelings of social pressure to engage in sex. Participants were 484 Mexican middle school and high school students (86% middle school, 50% female) between the ages of 12 and 19 (M = 14.3, SD = 1.5). Results indicated that parental psychological control was positively associated with engagement in oral sex, and was a better predictor of engagement in oral sex for boys than for girls. While social pressure was positively associated with all three sexual behaviors examined, gender did not moderate this association. These findings suggest that parental psychological control can impact the sexual development of Latino adolescents, and that Latino boys and girls respond similarly to social pressure regarding sex.

Commerce and condemnation: United States society, politics and the Haitian revolution 1791 - 1809

The formation of the U.S.’s earliest political parties was solidified by the policies regarding their French and British counterparts and thus, the Haitian Revolution. The two early United States political party's ideologies were heavily connected to foreign policy, specifically to a preference for the British or the French. The British and the French were both heavily involved in the Haitian Revolution. This international web of interests fed the political divisions in the U.S.
Environment

CHEMICAL CLEANING AND CATALYST-BASED ACIDIFICATION EFFECTS δ15N AND δ13C OF 
CRASSOSTREA VIRGINICA SHELL ORGANIC MATRIX

Nitrogen (N) and organic carbon (C) in ancient bivalve shells are promising environmental proxies, but appropriate sample processing is important before stable isotope analysis to obtain viable data. Previous bivalve studies for N and C stable isotope analysis (δ15N and δ13C) have not chemically cleaned samples before analysis and used a catalyzed (0.5% PtCl₂) acidification process to concentrate organic matter (OM). This study investigated the effects a catalyst and pre-cleaning has on stable isotope data from Crassostrea virginica shells. I acidified shell powder and found no significant differences in data with this catalyst present. I chemically treated samples (2% sodium hexametaphosphate or 4% sodium hypochlorite) before acidification and found cleaning reduced OM and N content, altered δ13C and C/N ratios, and increased δ15N variance, but did not significantly affect δ15N or C content. I suggest PtCl₂ is unnecessary for bivalve acidification and do not recommend cleaning before stable isotope analysis.

Health

IMPACT OF AGGRESSIVE VAPING STYLE ON RESPIRATORY SYMPTOMS OF E-CIGARETTE USERS

Respiratory symptoms including chronic cough are common among cigarette smokers. E-cigarette use (vaping) is a rising trend that eliminates toxic combustion byproducts of traditional cigarettes, resulting in fewer lung irritants. However, vaping styles vary widely, from aggressive ‘throat hits’ to light puffing. It remains unclear to what degree this variation contributes to respiratory symptoms. I hypothesize that former smokers who switch to e-cigarettes will generally experience improvement in respiratory symptoms, but that vapers engaging in aggressive vaping styles may experience attenuated improvement or worsening. In a cross-sectional study of former smokers who now vape exclusively, 70% of participants experienced improvement in chronic cough. However, vapers focusing on the throat hit experienced nearly twice the rate of persistent respiratory symptom worsening (RR=2.0, 95%CI 0.96-7). Smokers with chronic cough should consider e-cigarettes for symptom alleviation, however, throat hit style may be associated with respiratory symptom worsening a rare, but concerning observation.
**Poster #21**  
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**Department/School:** Biology and Marine Biology  
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**Environment**

**IS THERE A RELATIONSHIP BETWEEN SPONGES AND ALGAL COVER IN THE MESOPHOTIC ZONE?**

Benthic community composition on coral reefs changes as a function of depth through the mesophotic zone. Some researchers have proposed that sponges show a repeatable pattern of increasing biomass to 150 m on Caribbean reefs, while others have documented alternative patterns. We used photographs from remote operated vehicle (ROV) transects in Puerto Rico and St. Thomas (USVI) to examine patterns in the abundance of benthic organisms with depth. A standardized sampling protocol revealed that the percentage cover of macroalgae (encrusting and upright taxa) had a similar distribution to the cover of sponges. To further investigate this relationship, we examined the correlation between the cover of these two taxonomic groups at increasing sampling scales. Cover of sponges and macroalgae were not related at the quadrat scale, but were positively correlated at greater sampling scales. In addition, cover of both macroalgae and sponges declined consistently from approximately 20% at 110 m to zero at 170 m and deeper. These data appear to support the ‘vicious circle’ hypothesis, which proposes that sponges and algae cycle dissolved organic carbon (DOC) and dissolved inorganic nitrogen (DIN), creating a positive feedback loop that supports both benthic taxa.

**Poster #39**  
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**Environment**

**SURCA PROJECT**

**UAS-BASED REMOTE SENSING TECHNIQUES FOR ESTIMATING VEGETATION PARAMETERS AT HIGH SPATIAL RESOLUTION**

High-resolution imagery collected by an unmanned-aerial-system (UAS) rivals traditional aerial mapping, and is cutting edge technology when conducting research at a local level. Integrating UAS technology into current biophysical field-based remote sensing methods allows for better estimation of vegetation structure, composition, diversity, and vegetation biomass that can be further used as dependent data in modeling. In this study, a biophysical protocol was developed for data collection and processing of high-resolution UAS collected imagery obtained for the Kavango Zambezi (KAZA) Vulnerability and Adaptation research project in Southern Africa. Multispectral and RGB imagery was processed using Pix4Dmapper Pro drone photogrammetry software. Preliminary results indicate the capability of producing high quality Digital Surface Model (DSM), Digital Terrain Model (DTM), and Orthomosaic outputs using the protocol. Future models will utilize these outputs to quantify exposure-related aspects of vegetation productivity in relation to current land uses in the KAZA region at multiple scales.
STRUCTURES OF FEELING: VISUAL POETRY OF NORTH AMERICAN WOMEN SINCE 1950

This project examines the feminist interventions that American and Canadian women visual poets make into 'verbi-voco-visual' poetries of the late 20th and early 21st-centuries. By examining critically overlooked works of comics, collage, and visual poetry, I illuminate how the visual poetry of contemporary North American women operates as strategies of feminine aesthetic. Poets discussed in this thesis include Bianca Stone, Helen Adam, and K.S. Ernst, among many others. This research is completed through (1) a critical framework synthesized from major works of 20th-century poetics, (2) organic and opened-ended 'close readings' of select works, and (3) archival research. With materials dating from the early 1950s to 2016, this research contextualizes each poet in her own practice to consider how she harnesses the language of her experience and disrupts borders between art and life to forge a unique and visual-verbal feminist poetics.

PRICE DELAY AND ITS RELATION TO URBAN AND RURAL FIRMS

The Market Efficiency Hypothesis is a cornerstone in financial theory, which suggests that markets are very good at incorporating information into stock prices. However, how and at what rate information is incorporated is debated in the literature. In this study, we use Hou and Moskowitz’s (2005) Price Delay measure, to investigate whether or not information is incorporated more efficiently in rural firms or urban firms. The Price Delay measure utilizes time-series statistics to provide an intuitive measure of how quickly information is incorporated into stock prices. Our findings suggest markets may indeed be efficient since rural firms' do not seem to experience much more Price Delay than do their urban counterparts. These results help to further our understanding of how geography may impact information incorporation into prices.
POSITIVE EFFECTS OF A MINDFULNESS MEDITATION

Mindfulness has been linked to a healthier psyche and a greater sense of well-being. Meditations that are specific to mindfulness have been shown to have a positive effect on individuals in regards to their day-to-day emotional well-being. In this study 60 Undergraduate Student women engaged in a brief mindfulness meditation, which consisted of three meditation sessions being administered to the participants over the course of three weeks. The meditations lasted approximately 20-30 minutes each. Twice a week, the participant would complete the meditation and then fill out a meditation questionnaire. The questionnaires administered afterwards consisted of four true or false questions that dealt with how the participant felt after the meditation. It was hypothesized that the meditations would have more of a positive effect on participants after listening to the meditations for the second time.

USING MODEL SPECIES TO TEST LASTING EFFECTS OF COAL COMBUSTION RESIDUE ON ZOOPLANKTON POPULATIONS IN FRESHWATER LAKES

The Environmental Protection Agency (EPA) and North Carolina state regulators do not assess the effects of chemicals on dormant or developing zooplankton populations when managing freshwater resources. This may allow chemicals that negatively impact zooplankton during post-dormancy development to go unnoticed. Standard toxicology kits and assessments for EPA studies focus on the larval and adult life stages of zooplankton. However, zooplankton exposure to anthropogenic chemicals in lakes also occurs during embryonic dormancy and early post-dormancy development. This early exposure can disrupt the normal lifecycle by preventing zooplankton from reaching the larval stage, which in turn disrupts their ability to reestablish an active population as part of a natural seasonal cycle. To test the effects of coal combustion residuals on dormant and developing zooplankton embryos, dechorionated embryos of the brine shrimp, Artemia franciscana, were placed into surface water and sediment pore-water from Lake Sutton, which is a cooling reservoir for a former coal-fired power plant. To mimic natural exposures, embryos of A. franciscana were exposed during dormancy induced by anoxia and early development following dormancy. Exposure to Lake Sutton surface and sediment pore-water induced abnormal development or emergence to a minor extent in A. franciscana. Multiple zooplankton species must be used as models to assess how anthropogenic agents affect early development within diverse zooplankton communities. Using A. franciscana as a model was the first step. These tests are now being reproduced using a new ecologically relevant species, Daphnia magna.
Health

ANTIBIOTIC DISCOVERY: BACTERIA ISOLATED FROM UNIQUE ENVIRONMENTS WITH ANTIMICROBIAL ACTIVITY AGAINST ESKAPE PATHOGENS

Healthcare institutions have seen infection increases from antibiotic-resistant pathogens. Modern antibiotics become less potent against pathogenic bacteria due to their overuse and misuse. Recently, scientists revisited local environments in search of novel antibiotic-producing microbes in response to the increasing threat of resistance. Six different species of bacteria were isolated from unique environments: anthill sediment, lakeshore soil, and Indian Hawthorn leaves in coastal North Carolina. All isolates demonstrated positive inhibition against one or more ESKAPE pathogens and test bacteria in cross-streak tests and disk diffusion assays. The majority of the isolates were identified to the closest related species by 16S rRNA sequencing. After online research, little to no information was previously discovered on the antimicrobial properties of these isolates. Mass spectrometry and metabolomics profiling evaluate the bioactivity of the isolates with compound identification. Reverse phase HPLC will be a future technique to purify and identify the structure of potentially novel antimicrobial compounds.

Environment

SURCA PROJECT

INTERACTIONS BETWEEN SEAGRASS HABITATS AND OYSTER AQUACULTURE IN NORTH CAROLINA

Seagrasses, also referred to as submerged aquatic vegetation (SAV), are found in shallow coastal waters of North Carolina. Current regulations for seagrass habitat use in NC prohibit the lease of shellfish areas if SAV is present, which limits lease approvals and restricts efforts to increase oyster populations in coastal NC. Oysters are filter feeders known to improve water quality and, as a result, SAV may potentially benefit from the presence of oyster farms. The objective of this study was to determine whether oyster aquaculture will have a significant impact on the productivity of seagrass meadows by comparing SAV treatments in the presence and absence of oyster aquaculture in Topsail Inlet. There were no significant differences in water quality, sediment composition, seagrass biomass, and leaf productivity between the two treatments. Despite this, the results suggest that the oysters and the aquaculture structures had no negative impacts on the adjacent seagrass meadow.
A GRAPH THEORY APPROACH TO LANDSCAPE CONNECTIVITY

Ecologists, biologists and geographers all have reasons to study landscape and its connective properties. For this research, we take a Graph Theory approach to study landscape connectivity, and its effect on conservation and city planning. We use maps and geography to determine areas of interest and then analyze the connectivity of the areas. We then use Graph Theory to determine the best place to allocate needed resources to keep these areas of interest connected. Finally, we will study the development plan called Wilmington Vision 2020 from the city of Wilmington, North Carolina, and analyze how the city connectivity and flow should improve.

MEASURING IMMUNE RESPONSE IN ADULT M. BERYLLINA EXPOSED TO ENDOCRINE DISRUPTING COMPOUNDS IN EARLY LIFE

Previous studies on teleost fish have indicated that endocrine disrupting contaminants (EDCs) have the ability to interact with estrogen and androgen receptors present in T-cells. However, few studies have demonstrated the effects of EDC's on T-cell proliferation in teleost fish when exposed in early developmental stages. Furthermore, no studies have been performed to determine the potential for cross-generational effects of EDC's on T-cell proliferation in fishes. To address these knowledge gaps, we performed a phytohemagglutinin immune response assay to gauge the effects of EDC's on T-cell proliferation in M. beryllina. Fish were exposed to levonorgestrel, bifenthrin, ethinylestradiol, trenbolone at low ng/L concentrations, as well as a control (methanol) until 21 dph. Based on our results, there is more evidence suggesting estrogenic and androgenic EDC's have differential effects on the immune response of fish. Furthermore, some xenoestrogens appear to act via different mechanisms, resulting in varied effects on immune response.
MOBILIZING STUDENTS TO EMPLOY THEIR SOCIOLOGICAL IMAGINATION THROUGH APPLIED LEARNING

The goal of our project is to use applied learning experiences to help students in Dr. Vanderminden and Dr. Waity's mega introduction to sociology class understand the concept of the sociological imagination. Throughout the semester, the students will engage in applied learning experiences, including several activities and daily clicker questions, that enable them to apply course concepts and make connections between their individual experiences and the larger social and historical setting. Our project combines existing ideas on best practices in teaching in general, in sociology, in large classes, and through applied learning to create an environment that allows each student in a large class to be an engaged, active participant in the learning process.

HARMONIC OSCILLATION MODEL OF CLIMBING ROPE

The goal of our research was to model the harmonic oscillations of a climbing rope based on different weights falling on the rope, impact forces, and dynamic elongations. Understanding the dynamics of climbing rope oscillations can help rope developers to create different ropes for different purposes. Our model is based of a second order nonhomogeneous linear differential equation which is derived from Newton's Second Law and Hooke's Law. We will find solutions to this equation based on initial conditions from our data, and compare the different results. Our modeling is part of ETEAL applied learning in MAT-361, and will help us to understand the vibration mechanics of climbing ropes.
MODELING VULNERABILITY TO INLAND AND COASTAL INUNDATION IN NORTH CAROLINA USING HIGH-RESOLUTION FINISHED FLOOR ELEVATIONS

In the US, millions of people residing in inland and coastal areas will be affected by inundation related to increasing sea-level. With such a large population at risk, the identification of social and physical aspects of a population that are most vulnerable to a potential hazard is essential. The development of vulnerability assessments has gained recognition as a useful tool to identify vulnerable populations and has been integrated into mitigation and hazard adaptation planning. By applying a sensitivity and exposure framework, this study will model the potential impacts of inundation and identify the characteristics of the population that contribute to vulnerability. Most of the vulnerability assessments to date have been conducted at the county scale potentially hindering the effectiveness of mitigation and adaptation planning in real-world settings. However, using the 2010 US Census at the block-group level and high-resolution building finished floor elevations, this study will identify locations, at a finer scale, with potentially vulnerable populations in the socially and physically diverse coastal North Carolina.

USING GEOSPATIAL TECHNOLOGY AND FIELD SURVEY TO ASSESS THE EFFECTS CLIMATE CHANGE HAS ON CARBON STOCKS AND LOCAL WETLANDS, NEW HANOVER COUNTY

With the high frequency of coastal storms, the Wrightsville Beach barrier island acts as a buffer in preventing floodwaters and storm surges from reaching the very near mainland. The wetlands that back the island also act as a buffer while preforming vital processes such as decomposition of biomass, and filtration of water. An investigation was conducted to analyze the effects that climate change has on the backwater wetlands of the northern half of Wrightsville Beach. This work investigates the potential impact of current and accelerating sea level rise rates on the coastal wetland habitats in Wrightsville Beach using the simple bathtub, and the Sea Level Affecting Marshes Model (SLAMM) approaches. Dominant wetland species were mapped from very high-resolution WorldView-2 imagery through the hybrid classification algorithm. Spectral measurements were collected at the study site using a, field-radiometer, to assist in the validation of the derived classification map.
GRAPHICAL ANALYSIS OF ELECTRICAL CIRCUITS

Analysis of electrical systems has been an evolving topic of research that has changed the way we live in this world. Mathematical advances have improved everything in electrical circuit analysis from small circuit boards to massive electrical power grids. This paper explores the development of some of these mathematical tools through graph theory. Where algebraic methods failed, graph theory offered alternative tools for analysis. These methods led to historic revelations, such as Kirchhoff’s famous current and voltage laws. Employment of these laws, and others, in the analysis of simple circuits is reviewed. We focus this paper on powerful graph theory applications that can simplify the analysis of more complicated networks where algebraic methods alone are insufficient. The significance of graph edges, vertices, network flow, planarity, cycles, and more are examined.

COMPARING THE EXACT SOLUTION OF THE KDV EQUATION TO COMPUTATIONAL RESULTS FROM NUMERICAL METHODS

The authors' aim is to present an exact analytical result of the KdV equation through the use of rudimentary operations and derivations. Specifically, the equation will be evaluated to reflect the size and speed of solitons produced with respect to time. These exact solutions to the KdV equation, which involve many computations, may also be found with the help of the MATLAB computing environment. Another aim of the authors is to apply numerical discrete methods to the KdV equation. The exact solutions of the KdV equation can then be used to test the quality of the numerical methods by checking the numerical results against the exact solutions via MATLAB.
DEVELOPMENT OF THE COMPTON CALORIMETER FOR THE ETA-PRIMAKOFF EXPERIMENT AT JEFFERSON LAB

The eta-Primakoff experiment aims to perform a precision measurement of the eta radiative decay width via the Primakoff effect in Hall D to determine the light quark-mass ratio and the eta-eta' mixing angle. In addition to using the standard GlueX apparatus, a compact, high resolution electromagnetic calorimeter will be critical for controlling the experimental systematic uncertainty by detecting the electron Compton scattering in parallel to the physics production. In order to investigate the possibility of adding a scintillating hodoscope in front of the Compton calorimeter for the charged particle identification, I performed Monte Carlo simulations to study two primary quantities of interest, namely, the back splash from the Compton calorimeter and the electromagnetic background rate.

THE EFFECTS OF HEALTH ANXIETY, OPTIMISTIC BIAS, AND EXPERIMENTALLY MANIPULATED HEALTH INFORMATION ON HEALTH BEHAVIORAL INTENTIONS

The present study examined the effects of health anxiety and health optimistic bias on health behavioral intentions when exposed to health threatening information. 268 online participants completed measures of health anxiety and health optimistic bias then read a webpage about either health threatening or non-health information. Intention of participating in health behaviors was assessed. Overall, lower levels of health optimistic bias resulted in greater intention to participate in health behaviors. There was a cubic relationship for health anxiety, with low to moderate health anxiety having a linear positive relationship, followed by an inverse relationship for higher levels of anxiety. Furthermore, participants exposed to health threatening information reported a lower likelihood of participating in health behaviors, suggesting that both experimentally induced and high health anxiety are inversely associated with intent to engage in health behavior. While there were no significant interactions health anxiety and optimistic health bias were inversely related.
NORMAL USE OF ELECTRONIC CIGARETTES IS ASSOCIATED WITH RELIEF FROM DRY MOUTH/DRY THROAT SYMPTOMS: EXCESSIVE USE MAY CAUSE WORSENING

Dry mouth/throat symptoms occur in 37% of smokers and have also been reported in electronic cigarette users (vapers), but their prevalence is unknown. Because e-cigarettes contain no combustion byproducts, I hypothesize dry mouth/throat rates may be lower among vapers, but may depend on consumption metrics (amount, nicotine, device, etc.), which vary greatly among users. In a cross-sectional study of 239 people who switched from smoking to vaping, 35% reported ever having experienced such symptoms, with 27% reporting improvement and 8% worsening upon switching. Those who experienced worsening consumed significant more e-liquid (35.3 vs. 24.3 ml/week, p=0.05) and had vaped for approximately one additional year (p=0.01). There was no difference in the smoking history or demographics of these participants, but a suggestion that they might engage in more high-risk behaviors. Most people who switch to vaping experienced symptom alleviation, but those who overindulged in this new behavior may aggravate symptoms instead.

AUTOMATED NEURON RECOGNITION AND COUNTING USING COMPUTER VISION AND MACHINE LEARNING TECHNIQUES

The counting of neurons plays an integral part in the interpretation and analysis of many studies in neuroscience. However, the lack of modern computational techniques leaves many laboratories counting these neurons by hand. The core goal of this project involves applying modern computer vision and machine learning methodologies to provide a completely automated method for recognizing and counting neurons that have been stained with BrdU or DCX stains. The initial phase presented here involves comparing a variety of edge detection techniques for the detection of the granular layer in BrdU images. As all neurons are capable of accepting BrdU, identifying neurons only within this region allows for the detection of purely new neurons, and thus preventing miscouting. Following this detection phase, machine learning applications such as deep learning will be compared against algorithmic techniques to determine the most efficient approach for the counting of said neurons.
Poster #44
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ANALYSIS OF THE IMPACT OF CHANGING SNOWPACK EXTENTS ON DOWNSTREAM WATER SUPPLY IN THE PERUVIAN ANDES

Climate change is significantly affecting populations around the globe. Glaciers and snowpack are rapidly melting, leading to increases in the variability of river flows and affecting agriculture and food production as water availability becomes more unpredictable. Peru is a developing nation at the heart of these rising conflicts. We analyzed changes in snowpack depth and extent of the Peruvian Andes from 2001 to 2017 to determine if there has been a significant decrease in snow cover while considering El Niño occurrence. We determined which watersheds have been affected by changes in snowpack and vulnerable populations that have been affected by variations in water availability. Our results show that snowpack depth and extent has significantly decreased between 2001 and 2017 with serious implications for water and food security regionally.

Poster #61
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PSYCHOSOCIAL PREDICTORS OF REJECTION SENSITIVITY AND AGGRESSION

Social rejection may affect the way that individuals perceive their surroundings and interact with others. For instance, past research has linked this experience to an increase in hostile cognition and a greater tendency to react aggressively (DeWall, Twenge, Gitter, & Baumeister, 2009). However, other psychosocial factors may be associated with rejection experiences and sensitivity to rejection. The latter has been conceptualized as a tendency to harbor negative expectations towards social interaction (Mehrabian, 1970). The current study aimed to examine whether certain psychosocial factors would predict rejection sensitivity. We also investigated whether similar psychosocial factors would predict levels of trait aggression. A model was constructed that significantly predicted sensitivity to rejection, $F(4, 347) = 57, p < 0.001$, and explained 40% of the variance in scores. Another model was constructed that significantly predicted trait aggression, $F(2, 427)= 33, p <0.001$, and explained 13% of the variance in scores.
Poster #67 (abstract only)

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SURCA PROJECT

THE PROBABILITIES OF WINNING AN UNNECESSARILY LONG GAME

This study will examine the probability of flipping a coin to figure out the amount of time it takes for one or more players to finish the board game composed of 31 spaces. By studying the simple random walk process and finding probabilities, a proof will be provided of the expected duration of the game for one player. The duration of a multi-player game will be accurately modeled by simulations in python. It is assumed that with more players, the total time required to finish the game would reduce due to the increased total number of coin flips allowing for a higher chance of a coin flip granting forward movement. Using python, the duration of the game when there are random variables introduced can be assessed. For example, the incorporation of variables such as chutes and ladders that move a player back or forward more than 1 space, respectively.

Poster #79

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SURCA PROJECT

ART AND THE BRAIN: USING FUNCTIONAL NEAR-INFRARED SPECTROSCOPY TO EXPLORE THE ROLE OF THE PREFRONTAL CORTEX IN PERCEIVING AND PRODUCING ABSTRACT AND REPRESENTATIONAL ART

The goal of this study was to examine possible differences in brain activity when participants perceived and produced abstract versus representational art. Using functional Near Infrared Spectroscopy (fNIRS), we focused on the activity in the rostral prefrontal cortex (rPFC), a key node in the brain's default mode network (DMN), a network of regions that is active when a person directs their attention inward. Participants included trained artists and non-artists who made liking judgments for a series of abstract and representational paintings by well-known painters. Participants also, in separate conditions, briefly produced two abstract and two representational drawings. Analyses focused on the role of DMN in processing and producing abstract versus representational art, differences between trained artists and non-artists, and evaluation of recent hypotheses about the role of top-down versus bottom-up processing in the processing and understanding of visual art.
**Poster #62**  
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**PREDICTING POPULATION AND CARRYING CAPACITY IN WILMINGTON, NORTH CAROLINA**

By comparing population values previously recorded in Wilmington, North Carolina, we will potentially predict the population of Wilmington in any given year, as well as what the possible carrying capacity will be for Wilmington. Carrying capacity can cause problems with population growth, due to the capacity meaning the maximum value that a population can achieve, regardless of the amount of time that passes. When a population reaches that limit, in this case humans, then the population growth would peak, and the rate of increase would hit 0.

**Poster #63**  
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**FACIAL RECOGNITION OPTIMIZATION ON THE MORPH-II DATABASE**

Face recognition has become a vital tool for applications such as video surveillance in government and workplace settings. Much of this research focuses on small and highly controlled databases. Utilizing the MORPH-II database, this project works to optimize the facial recognition system by analyzing how the choice of subspace projection algorithm (dimension reduction method) and various distance metrics impact accuracy. Eigenfaces (Principal Component Analysis) and Fisherfaces (Linear Discriminant Analysis) are analyzed against different classifying techniques, Support Vector Machine and Nearest Neighbor. Using the Nearest Neighbor approach, eight unique distance metrics are tested. By running several experiments, we are able to identify the potential for reducing computational times for these various methods as well as improve accuracy rates when it comes to correctly identifying an individual in the database.
GRAPH THEORY IN COMMUNICATION: WITH FOCUS ON CRYPTOGRAPHY AND LINGUISTICS

Graph Theory can be used in communication; specifically in linguistics and cryptography. In linguistics, it can be used to find pronunciations of words through rhyme schemes across languages. Communities and clustering are used to represent the relationship between rhyming words. In cryptography, key graphs can be used in managing group key distribution. We will use graphs to model rhyme scheme connections as well as to create a more efficient and secure rekey scheme.

FITNESS-RELATED BENEFITS: LAND-BASED VERSUS AQUA-BASED

PURPOSE: To compare fitness-related benefits between land-based (LAND) versus aqua-based (AQUA) courses. METHODS: Informed consent was received from 154 volunteers (N = 76 LAND; N = 78 AQUA). Pre- and post-fitness assessments obtained were body composition, muscular endurance, muscular strength, cardiorespiratory endurance, and flexibility. RESULTS: Mixed ANOVA was used to investigate mean differences between pre-and post-fitness assessments and between groups. Individuals participating in land-based courses displayed greater decreases in percent body fat when compared to aqua-based courses, whereas both land- and aqua-based displayed improvements in muscular strength and muscular endurance. There were no changes in cardiorespiratory endurance and flexibility within both groups.
MODELING NORTH CAROLINA TEACHER INCOME

Teachers have many factors to consider when deciding where to accept a position. Accrued debt and salary are major deciding factors when accepting a potential position. North Carolina has historically been a low teacher salary pay state, and continues to be of concern. It is argued that teacher discretionary income after paying monthly debt obligations is insufficient to support today's standard of living. The purpose of this model is to replicate based on ten years' worth of historical data (2006-2016) the remaining income to North Carolina teachers' disposal once debt obligations are considered. The model will also be useful in determining based on current economic conditions as whether or not it would be feasible to accept a position in North Carolina.

ANTIBIOTIC-PRODUCING BACTERIA DISCOVERED AT LOCAL ANNE MCCRARY PARK

The discovery of new antibiotics is becoming a growing need in the world as bacteria evolve to be immune against our medicines. With the vast amount of soil covering the Earth, more antibiotic compounds are bound to be in our soils, waiting to be discovered. With this research project, my goal was to search for antibiotic activity in soils collected from the Wilmington area. In doing so, I found a microbe at the Anne McCrary Park that produces an antimicrobial compound and inhibits the growth of four of the six ESKAPE pathogens, including S. aureus, K. pneumoniae, A. calcoaceticus, and P. aeruginosa. After sequencing the 16S rRNA, I discovered that this bacterial species is Pseudomonas soli. Though this species was previously known to have antibiotic activity, there is a need for continued study to determine the identity of the actual compound.
IMPACT OF IMPERVIOUS SURFACE ON HOWE CREEK

Tidal creek watersheds are complex ecosystems; they are highly sought-after locations for human habitations, which can bring with it many challenges. The impacts of coastal development can be observed in these highly sensitive ecosystems before being evident in larger coastal water bodies, such as sounds or the Intracoastal Waterway. Research has shown a correlation between the amount of impervious cover and the amount of pollutants found in the water of tidal creeks. Howe Creek has seen effects of impervious cover as shellfish harvesting is prohibited. Through land planning design, Low-impact development (LID), can manage stormwater runoff more effectively and reduce pollutants from entering the stream. I have utilized GIS and historical data to corroborate the declining water quality of Howe Creek within New Hanover County, which is a transboundary watershed. Each party involved has different managing practices of stormwater runoff. This creates unique challenges for overall management.