

Spring 2019 URCT Descriptions:

The Descendants Project—Towards Truth and Reconciliation in Warren County, N.C.

Faculty Advisor: Glenn Hinson (*Anthropology & American Studies*)

URC Team: Veronica Chandler, Taylor Gartman, Abbott Ndukwe, Meagan Watson

In 1921, a white mob in Warren County, N.C., lynched two innocent men. In the years since, the county's "authorized" histories have erased all records of these murders. Sharp memories of the lynchings, though, are still very alive in the region's Black communities. In fall 2018, a UNC class began collaborating with the Warren County NAACP to foster public awareness of these lynchings, with hopes of creating a memorial to the "victims, and then sparking a broader truth and reconciliation process. The URCT team—who, with the class, had archivally identified, and then interviewed, descendants of the 1921 victims—will extend this process by gathering oral histories from community elders and exploring long-hidden archival materials that document the double-lynching. By compiling the storied and written history, the team will actively contribute to the reconciliation process, and help craft a model that other communities can use to address contested public memories.

Brine Shrimp as a model for Plankton Movement

Faculty Advisor: Laura Miller (*Mathematics & Biology*)

URC Team: Maddie Bye, Liam Pongrance, Reagan Howell, Gloria Hope, Abinaw Katuru

Both physical and biological mechanisms affect the movement of zooplankton. These tiny aquatic animals are move with the local flow but can also bias their distributions actively controlling some aspects of their locomotion. Mathematical models of plankton movement typically assume that the organisms either 1) go passively with the flow or have an additional random motion that can be added to the background flow velocity. These assumptions have not been rigorously tested. We will use brine shrimp as a model organism for studying the movement of plankton given its ease of culturing in the lab. The broad goals of this Undergraduate Research Team are then to 1) determine the relevant fluid dynamics and physics for individual swimming brine shrimp, 2) reveal some of the behaviors of plankton that may drive long distance dispersal, and 3) incorporate fluid physics and behavior into mathematical models and experimentally validate those models.

The Recycling Robot: Experiential Education and Community Outreach

Faculty Advisor: Frank Leibfarth (*Chemistry*)

URC Team: Hayden Dumaw, Megan Ramsey, Charlotte Dorn, Kristopher Lukas, Suraj Pendyala

This project revolves around a recently published manuscript that describes the construction of an open source plastic extruder that can take scrap 3-D printing waste and recycle it into commercial quality 3-D printing filament. Students will construct an improved version of the recyclebot and use it to explore their own sustainability-based research project. Once built, students will use this recyclebot for outreach in the Chapel Hill-Carrboro area as well as

establish a recycling service for local 3-D printer users.

Psychosocial stress, inflammation and immune function

Faculty Advisor: Mark Sorensen (*Anthropology*)

URC Team: Supreet Goraya, Vaishnavi Sripurapa, Zachary Cochran, Leva Juzumaite, Michera Gentry

The purpose of this study is to investigate the impact of psychosocial stress on inflammatory profiles of traditional age college students and how this relationship is potentially modified by physical activity. The goals of this study are 1) to identify and map the most prominent cultural domains of stress amongst college students, 2) to understand how these chronic stressors impact inflammatory profiles, 3) to understand the inflammatory response of college students to acute stress, and 4) to illustrate the role of physical activity in moderating against the negative impacts of psychosocial stress on inflammation. Semi-structured interviews, free listing, pile sorts, and risk mapping will be used to identify the cultural domains of stress experienced by college students. Accelerometry and questionnaires will be used to quantify physical activity. Biomarker collection will be used to measure both cortisol and inflammatory profiles for each participant.

The Dual Burden of Disease in Galápagos, Ecuador:

An Interdisciplinary Study of Food & Water on Isabela Island

Faculty Advisors: Dr. Amanda Thompson – *Lead Advisor*

Associate Professor of Anthropology and Nutrition

Dr. Margaret (Peggy) Bentley

Chamblee Distinguished Professor of Global Nutrition

Associate Director, Institute of Global Health and Infectious Diseases

Associate Dean for Global Health, UNC Gillings School of Global Public Health

Dr. Jill Stewart

Associate Professor of Environmental Studies and Engineering

Deputy Director, UNC Galápagos Initiative and Center for Galápagos Studies

URCT Team Members: Don Fefjar, Elijah Watson, Kishan Patel, Nick Badhwa

Students will travel to Isabela, Galapagos, Ecuador to conduct an interdisciplinary study of food and water quality, security, and accessibility on the island. This will be done through GIS and laboratory analysis of water samples, food frequency and diet surveys, and in-depth ethnographic interviews. Results will be shared with residents at an annual research symposium in the Galapagos and create background for potential interventions.

Spring 2018 URCT Descriptions:

Title: *Facilitating Navigation through Documents by Individuals with Low Vision* This project will investigate ways of facilitating navigation through documents by individuals with severely impaired vision (low vision) who nonetheless retain some ability to read. The research project will focus on the target case of facilitating use of an outline while conducting a deposition by

a lawyer with retinitis pigmentosa. RP causes severe narrowing of the visual field such that an individual with the condition may be able to see clearly in the very center of the visual field but cannot pick up any information from the periphery of the visual field. Without peripheral vision it is impossible to take advantage of the organizational information in an outline. Instead, an individual with a very small visual field must start reading the outline at some point and search forward a word at a time from that point. A similar problem occurs when text-to-speech synthesis is used in screen readers; conversion of text-to-speech begins at one place in the text and proceeds serially from that point. In both situations the ability to navigate to regions of text that are most informative is greatly reduced, making it very difficult to use notes to help in an ongoing task. While the project will focus on the target case of a lawyer with RP conducting a deposition, it is expected that the results could be generalized to other situations where individuals with low vision could benefit from using notes while engaged in goal-directed activities. The goal for this one semester course is to evaluate the feasibility of a larger-scale project aimed at systematic empirical study of text navigation by individuals with low vision and at the development of assistive technology for text navigation that is tuned to an individual's pattern of preserved and impaired abilities.

Title: *The effects of physical activity, psychosocial stress, and sleep on inflammation*

Coronary heart disease and stroke are two of the leading contributors to mortality and morbidity among adults in the United States. Previous research has shown that inflammation is related to cardiovascular outcomes, yet the development of inflammation in healthy young adults is not well understood. This study investigates lifestyle, obesity and inflammation in college students in order to understand the inflammatory process in young adults. The study objectives are to 1) investigate variation in inflammatory biomarkers and the relationships between biomarker and body composition and cardiometabolic risk; and 2) examine independent associations between inflammation and stress, physical activity, and sleep. We hypothesize that higher concentrations of inflammatory cytokines will be associated with higher waist circumference, abdominal adiposity, blood pressure and lipids. We hypothesize that inflammation will increase in response to baseline psychosocial stress, low physical activity levels, and poor sleep quality/duration, therefore, we expect students with higher chronic stress, sedentary lifestyles, and poor sleep habits will have higher levels of inflammation. Inflammatory cytokine levels, however, will be lower in individuals with higher levels of physical activity, low stress, and those who experience quality sleep. It is hypothesized that the interaction of these three lifestyle factors (physical activity, sleep, stress) will have a larger impact on inflammation than each individual factor alone. Longitudinal physical activity, sleep (7-days each) and stress (3 days) data will be used to develop a 'risk index' that predicts levels of inflammation and cardiometabolic risk. The study will recruit 30 UNC students. Health profiles will be generated via questionnaire, monitoring devices and biomarkers, and will be used to examine inflammation and its relationship to physiological and lifestyle characteristics. The data collection process will occur over total

Title: *Women in Political Technology*

Over the past few years, scholars have pursued the first systematic analyses into the organizations and staffers that create and manage contemporary political communication. To date, however, there has been a lack of studies on the experiences of female communication practitioners in this historically male dominated field, especially in the context of the growing area of political technology. This URCT study inquires into the experiences of women working in the domains of technology, digital media, data, and analytics on political campaigns. We are empirically documenting the overall hiring patterns of women working in the domain of political technology, analyzing a comprehensive dataset (N=876) of all staffers working on Democratic and Republican primary and general election presidential campaigns from 2004-2016. We are also conducting a series of open-ended and semi-structured qualitative interviews with female practitioners in this dataset to learn about their experiences working in political technology. Through these interviews we aim to understand, in a rich qualitative way, if these women have felt supported in the course of their careers, the workplaces that they encountered on campaigns, the mentor relationships they have had and their importance, and the barriers toward women's advancement in political technology (or the key variables behind their success.)

Title: *Diabetes & Dance: Empowering Patients Through Movement*

For clinicians and public health researchers, the 29 million Americans with Type II diabetes represent a medical problem of vast proportions. Diabetes is a top-ten cause of death costing billions in medical dollars, increasing by 1.4 million new cases per year. Accordingly, treatments and interventions focus on mitigating physiological symptoms; however, there are also psychological symptoms that need to be addressed. Dance has been studied as a therapy method for many diseases and chronic illnesses. While previous studies have shown the positive impact that dance has had on the physical condition and abilities of patients with chronic illnesses, studies that evaluate the effects of alternative therapy methods such as dance have on a patient's body image and psychological well-being are more novel. This study will focus on the psychological aspects of this particular intervention method. Our hypothesis is that participants in a series of dance classes will show reductions in diabetes distress, improvements in diabetes empowerment, and/or improvements in body image. The rationale for the resulting increased empowerment and body image

is that dance as an alternative form of therapy will allow the patients to express themselves and their experiences with diabetes in a positive manner. This expression will allow the patient to have a better relationship with their diabetes and with their body. During the eight-week dance workshop, participants will learn four different dance styles: Bollywood, Hip Hop, Contemporary, and Latin. Each style is meant to invoke a specific emotion within the participants, and will be explored over the course of 3 bi-weekly classes each. The results from this study may allow parties who work closely with diabetes patients, such as diabetes consultants, physical and psychological therapists, and medical professionals, to learn more about the experiences of diabetes patients, opening avenues for more personalized care options.

Title: *Examining Factors Affecting Day-of-Game Ticket Sales for the Durham Bulls Minor League Baseball Club*

The objective of this Undergraduate Research Consultant Team project is to partner with the Durham Bulls minor league baseball team to develop a predictive model for home day-of-game (walk-up) ticket sales based on a variety of external and internal inputs. Once the best model with the highest value is established, the URCT would then produce a self-updating, software interface which the Bulls could use to input daily variables and derive attendance predictions. Such a tool would enable the team to better set ticket pricing, schedule promotional elements, and understand more intimately their consumers' behaviors. Bulls team executives have expressed a desire to have software which could produce this sort of analysis and after preliminary discussions with these team executives, the Bulls have already agreed to share ticketing and scheduling data captured over the past five seasons. The URCT would meet with team executives early in the spring to learn more about the team's business objectives and about what team data is currently available. Once the URCT understands both the team's specific business concerns and what sorts of data are available for analysis, students will begin collecting, sorting, and cleaning numerous variables (ticket price, weather conditions, promotional activities, day of week, opponent information, etc.) with the end goal of finding the factors which most predict variance in attendance. Variables would include both data already captured by the team and outside marketing variables such as weather, opponent quality and additional events occurring in the community.

Title: *Desferoxamine Coated Suture to Improve Tendon Healing Strength*

Injuries to hypovascular regions of tendon and menisci have a low healing potential, and there is a great need to identify effective stimuli for healing of such injuries.

Hypoxia inducible factor-1 α (HIF-1 α) is a transcription factor that leads to coordinated expression of genes associated with angiogenesis, glucose transport, matrix metabolism, and cell proliferation. This proposal will investigate local delivery by suture of the HIF-1 α regulator, desferoxamine (DFO), to the repair site as a means to improve healing outcomes. The first objective of the proposal is to develop a rapidly biodegradable coating for delivery of DFO on several nonabsorbable suture materials used for tendon repair, and characterize the delivery time course in the lab setting. In the second objective of the proposal, a rat Achilles tendon repair model

will be used to evaluate the in vivo performance of the DFO coated (at two concentrations) suture relative to a control suture with coating alone. We will evaluate early healing outcomes including tensile strength, collagen organization, and vascularity of the healing repair. The expected contribution of the research is that local delivery of DFO on suture to the repair site can serve as a cost-effective and reliable means to increase vascularity and improve healing strength after tendon injury. The new technology will provide the surgeon a tool to spatially direct blood vessel formation by a master switch stimulus in surgical applications where hypovascularity diminishes health outcomes. It is anticipated the described approach will overcome past limitations of using a single growth factor to coat suture in attempts to improve tendon healing.