



# HONORS COLLEGE

The University of Texas at Arlington

## HONORS RESEARCH SYMPOSIUM PRESENTATION ABSTRACTS

NOVEMBER 17, 2017

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**MISBAH AHMED, EDUCATION**

Title: *Implementing Project-Based Learning: The Effects of Standardization in a Texas Middle School*

Faculty Mentor: Dr. Kathryn Pole

Project-based learning is a teaching methodology that requires students to work collaboratively in order to solve an authentic, real-world problem that is driven by inquiry. Due to the student-driven nature of project-based learning, the methodology contains many instructional components and requires a great deal of planning from the teacher. This can pose a challenge to teachers in an era where standardized testing is a primary focus in schools; and teachers must manage benchmark testing and test preparation, in addition to day-to-day instructional activities. To understand the impact standardization has on project-based learning, a Qualtrics-based survey was sent out to faculty at a Texas project-based learning middle school and the responses were coded for themes. The study revealed that time management and meeting all state standards were the biggest challenges when implementing project-based learning. This indicated that standardized instructional pacing created barriers and limitations for seamless implementation of project-based learning.

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**VALERIE BILTON, NURSING**

Title: *Establishment Of Atac-Seq Library for Epigenomic Profiling During Myogenesis*

Faculty Mentor: Dr. Zui Pan

Muscle dystrophy and cardiomyopathies result in the lost capability of the muscle cells to regenerate after muscle injury or exercise. Understanding the genes that regulate muscle expansion and differentiation (myogenesis) may help us to find potential cures. ATAC-sequencing is a fairly new unbiased genomic approach used to isolate and analyze the genomic DNA of cells, in this case, the C2C12 mouse muscle cell line. The original ATAC-seq protocol causes the product to be contaminated with anywhere from 20-80% of unusable mitochondrial DNA information. The goal was to optimize the method so that a high-quality library of muscle cells could be created. Modifications were made in the first step of the protocol to further separate everything not of nuclear DNA material. The modifications resulted in significantly reduced mitochondrial DNA contamination. However, the modified protocol did not lead to higher quality sequencing and analysis compared to the original protocol.

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**ALYSSA BRAGG, EXERCISE SCIENCE**

Title: *Does Short-Term Vibration Plate Training Have an Effect on Balance in College-Aged Females?*

Faculty Mentor: Dr. Cynthia Trowbridge

The risk of an anterior cruciate ligament (ACL) tear in the knee is 2 to 10 times higher in women than in men. Biomechanical differences including the stability of the knee have been identified as potential causes. The purpose of this study was to determine if 5 days of whole body vibration-based training would result in improvements in the balance of healthy females. Subjects were randomized into a treatment and control group and were pre and post-tested using the Y-Balance test and the Limits of Stability test. The treatment group performed 6 core and lower extremity exercises using a whole body vibration plate over 5 treatment sessions.

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**DARSHAN CHALISE, MATHEMATICS**

Title: *Representations of the Lorentz Group*

Faculty Mentor: Dr. Dimitar Grantcharov

In his fundamental work in 1939, Eugene Wigner used the Poincare group to induce representations from the fundamental internal space-time symmetries of relativistic quantum particles. Since then the representations of the Poincare group and Poicare algebra attract considerable attention both in theoretical physics and mathematics. In this talk we will investigate and relate to each other several different types of representations of the Lie algebras  $sl(2)$ ,  $su(2)$ , and  $so(3)$  that lead to representations of the Poincare group. Our explicit formulas allow to find necessary and sufficient conditions which of these representations are isomorphic to each other.

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**DARSHAN CHALISE, PHYSICS**

Title: *Search for Invisible Decay of Heavy Higgs Bosons*

Faculty Mentor: Dr. Andrew White

Higgs Boson is the particle responsible for giving mass to all known fundamental particles in this universe. Higgs Boson with a mass of  $125 \text{ GeV}/c^2$  was discovered in the Large Hadron Collider(LHC) at CERN in 2012. Many theories predict heavier Higgs Bosons beyond the Higgs discovered in 2012. Higgs Bosons can mediate the interaction of Dark Matter with normal matter and limits deriving from the search for invisible decays of Higgs Bosons can be used to set limits on the interaction of Dark Matter with normal matter. Two leading LHC experiments, ATLAS and CMS, have conducted research on invisible decay of  $125 \text{ GeV}/c^2$  Higgs Boson. This thesis explores the possibilities of invisible decay of heavier Higgs Bosons. The results are compared with the analysis involving  $125 \text{ GeV}/c^2$  Higgs Boson.

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**DIVYA CHALISE, MECHANICAL ENGINEERING**

Title: *Conjugate Heat Transfer Analysis of Thermal Management of a Li-Ion Battery Pack*

Faculty Mentor: Dr. Ankur Jain

Thermal management of Li-ion battery packs directly impacts the safety and performance. Removal of heat generated in individual Li-ion cells into the ambient is a considerably complicated problem involving multiple heat transfer modes. This research develops an iterative analytical technique to model conjugate heat transfer in a Li-ion battery pack. Solutions for the governing energy conservation equations for conduction and convection are derived and coupled iteratively to determine the final temperature distribution. The analytical model is used to investigate the dependence of the temperature field on various geometrical and material parameters. The model shows that the coolant flow rate required for effective cooling can be reduced significantly by improving the thermal conductivity of individual Li-ion cells. Further, the model helps understand key thermal-electrochemical trade-offs in the design of thermal management for Li-ion battery packs, such as the trade-off between temperature rise and energy storage density in the battery pack.

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**SANJARI CHELAWAT, FINANCE**

Title: *Explaining the Connection between the Returns on Fixed Income Mutual Funds and Underlying Securities' Yields*

Faculty Mentor: Dr. David Rakowski

One of the most attractive sources of income is investment in fixed-income securities. However, due to inadequate understanding of the inherent risk of these securities and numerous other factors, investment in fixed-income securities is often made indirectly through fixed-income mutual funds, or funds that pool contributions of individual investors and further invest it in securities such as bonds that provide fixed returns. This study attempts to determine how returns on fixed-income securities are related to corresponding returns on fixed-income mutual funds. By using algebraic equations to ascertain bond prices and yields, the study models the return of a typical mutual fund based on the prices and yields of the underlying bonds. The study finds that bond returns, and therefore fund returns, are systematically related to the ratio of past and future bond yields.

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**LAUREN CRANE, NURSING**

Title: *Obesity, Dyspnea on Exertion, and Health-Related Quality of Life in Obese Men*

Faculty Mentor: Dr. Deborah Behan, Dr. Rubria Marines-Price

Dyspnea and obesity can have a negative influence on a person's health related quality of life (HRQOL). However, it is unclear if these relationships can be found in otherwise healthy obese young men. We examined the relationship between 1) obesity and HRQOL, and 2) dyspnea on exertion (DOE) and HRQOL. A secondary analysis was conducted from the baseline data of an interventional 12-week weight loss study. The Medical Outcomes Short Form-36 (SF-36) was used to measure HRQOL. Percent body fat and BMI was the measurement of obesity. Dyspnea on exertion (DOE) was measured by ratings of perceived breathlessness (RPB; Borg Scale 0-10) during a six-minute submaximal constant load cycle test. We found that when there is an increase in BMI and DOE there is a decrease in physical functioning scores. In addition, when there is an increase in percent body fat there is a decrease in social functioning scores.

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**JEREMY DUBHROS, ANTHROPOLOGY**

Title: *Cultural Translation and the Iconography of the Master and Mistress of the Animals*

Faculty Mentor: Dr. Karl Petruso

The image of a figure holding two wild animals, often called the "Mistress/Master of Animals", has appeared across many periods and regions, spanning artifacts from proto-literate Mesopotamia in the Near East to the Aegean Iron Age. Far from being a randomly occurring icon, this motif has a demonstrable chain of cultural custody that is closely tied to concepts of divinity and royalty. Rather than a linear progression of diffusion with consistent interpretation, the Master/Mistress motif is culturally translated by adopting populations to suit the understandings within those populations. Though some concepts such as 'healing' remained constant, the symbol was reinterpreted or modified based on the place the concept held in the population's cultural schema. This resulted in the two seemingly separate motifs of the "Master" and "Mistress". This translation demonstrates the close relationship these early cultures had to one another in spite of their perceived distinctness.

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**IRETOMIWA ESHO, MECHANICAL ENGINEERING**

Title: *Measurements and Modeling to Determine the Critical Temperature for Preventing Thermal Runaway in Lithium-ion Cells*  
Faculty Mentor: Dr. Ankur Jain

Understanding the nature of thermal runaway in Li-ion cells is critical for the safety of electrochemical storage and conversion systems. Specifically, it is important to understand and predict the temperature beyond which the cell enters thermal runaway. This work presents an experimentally validated, analytical method to predict the critical temperature based on the balance between temperature-dependent heat generation, thermal conduction in the cell and heat dissipation on the cell surface. It is shown that the critical temperature can be determined from the root of an equation involving parameters from Arrhenius heat generation, thermal conduction and convection on the cell surface. The predicted critical temperature is found to be in good agreement with experimental measurements on a thermal test cell. Results presented here develop the capability of accurately predicting the critical temperature of a Li-ion cell, and may contribute towards effective thermal management design and the prevention of thermal runaway.

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**ISLAM HAMMAD, BIOLOGY**

Title: *Effects of Exercise Location on Perceived Stress*  
Faculty Mentor: Dr. Daniel Levine

Stress is the result of how an individual interacts with stressors and the way the individual perceives those stressors. Stress in college students and in people in general can lead to burn out. It is vital to try and overcome it in a healthy way. To further understand the different ways stress levels can be reduced, a method was chosen and performed to see if exercise and environment can have an effect on stress in students. The experimental students took the Perceived Stress Survey Inventory (PSSI) and were then instructed to walk one mile every day for one week at UTA or a park. Results showed there was no significant decrease in stress based on environment. However, there was a significant difference in stress levels demonstrating that exercising did reduce stress.

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**PHYLLIS HELMS, NURSING**

Title: *Tools of the Trade—Improving Nurses' Ability to Access and Evaluate Research*  
Faculty Mentor: Dr. Deborah Behan

In their daily practice, nurses continuously seek answers to clinical questions. It is critical that they know how to find evidence-based data to guide their care and optimize patient outcomes. There are few studies of processes to increase nurses' ability to find and analyze evidence for practice. Therefore, the purpose of this longitudinal quasi-experimental descriptive study was to measure the effect of an educational project on nurses' knowledge and frequency of using library database resources to acquire and appraise evidence-based practice (EBP). A secondary purpose was to examine the effects of nurse characteristics (educational background, professional certification, and experience) on nurses' library resource knowledge and usage. Twenty-eight nurses participated in the project. Mean scores for the knowledge and frequency sections of the questionnaire had statistically significant improvements for four of the five questions. Overall, the brief training influenced the nurses' ability to search for, find and appraise evidence-based information.

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**ALYSSA HERNANDEZ, POLITICAL SCIENCE**

Title: *Campaigning to Millennials—How Social Media Affects Voter Turnout*  
Faculty Mentor: Dr. Herschel Thomas

Social media establishes an instant connection between people online and has become an outlet for young adults to express their ideas, opinions, and beliefs with others. Previous scholars have broadly studied voter turnout and social media, but little is known about the impact of candidates' presence on social media in relation to young voters. In this paper, I extend the research on social media and voter turnout by focusing exclusively on millennials. To test my hypothesis, I administered an original survey to 362 millennials that attend the University of Texas at Arlington in the spring of 2017. The results show that, when controlling for political interest, there is a positive relationship between if a millennial follows a candidate on Twitter and the probability of them voting. This suggests that candidates' use of social media may influence whether millennials are likely to vote on election day.

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**MOSTOFA HISHAM, MATHEMATICS**

Title: *The Mathematics behind Medical Imaging*

Faculty Mentor: Dr. Gaik Ambartsoumian

Imaging techniques have a wide array of applications in various fields of technology. One such application is medical imaging, such as the use of Computerized Axial Tomography (CAT) or Magnetic Resonance Imaging (MRI). The mathematical techniques behind such imaging technologies will be discussed, such as the transformation of a given set of data representing an object into a mathematical function. This data will be transformed through as Radon transform that shows certain characteristics of a set of data in terms of two variables that completely describe the data set. However, the Radon transform only transfers the data into a sinusoidal form, which must then be transformed into the image of the object by Fourier and inverse Fourier transform of the Radon Transform, and then applying the Back projection of this transformed set of data. This final data set should reflect the original object provided by the data set.

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**MOSTOFA HISHAM, PHYSICS**

Title: *Engineering Plasmonic Devices with Low Scattering and Tunable Carrier Density*

Faculty Mentor: Dr. Joseph Ngai

Plasmonics, the study of the interaction of an electromagnetic field with free electrons in conductors, allow devices that would combine the speed of photonic devices with the scalability of electronics. Efficient plasmonic devices should exhibit a low scattering of electrons, and a tunable carrier density. Undoped semiconductors exhibit very low carrier scattering; however achieving tunable carrier density is challenging. This project will involve the growth of crystalline oxides on undoped semiconductors to achieve tunable carrier densities in the semiconductor via charge transfer. A LABVIEW program will be made that will measure the traditional and Hall voltage of the sample. The latter, known as the Hall voltage, is measured perpendicular to the applied current and enables the carrier density to be quantified when measured in the presence of a magnetic field. The LABVIEW program will be interfaced with a commercial cryomagnetic system to perform the measurements.

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**VALERY LOFTON, NURSING**

Title: *Partner Cuing in Relation to the Middle Range Theory of Flight Nursing*

Faculty Mentor: Dr. Mary Mancini

Flight nursing involves the care and transport of critically ill patients in uncontrolled environments. Because of the critical nature of this role, it is crucial to understand what flight nursing expertise entails. This study examines the proposed Middle Range Theory of Flight Nursing; specifically, focusing on the concept of partner cuing and its influence on clinical expertise. The study utilized a two-part investigation of the theory that involved both the administration of surveys, as well as in-flight observations of flight crews. After administration of the surveys to 9 flight nurses, observations took place focusing on nurse-partner interactions in the field. Survey responses aided in identifying the role that partner cuing has in the care of patients. Direct observation confirmed that partner cuing plays a significant role in real world flight nursing practice. Identification of this phenomenon can be influential in future training and education of nurses in this career.

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**VIRGINIA MORRIS, HISTORY**

Title: *Reconstructing the Past: Rebuilding Churches and Reinventing Identity in Postwar Germany*

Faculty Mentor: Dr. Joyce Goldberg

When the Second World War ended in 1945, Germany lay in ruins. Divided East and West, under Western and Soviet occupation, their country devastated, Germans began to rebuild their lives, homes, and country while searching for a way to process their role in the war, their defeat, and its meaning for themselves as a people. One way they began to reconstruct a sense of identity was to highlight historic German cultural creations. Germans, amidst the physical and political turmoil that surrounded them under military occupation, expended extraordinary efforts to preserve and rebuild two churches nearly obliterated by Allied bombing--the *Frauenkirche* of Dresden in East Germany and the *Kaiser-Wilhelm-Gedächtniskirche* of Berlin in West Germany. The struggle to preserve as much as possible the pre-war appearance of these universally-recognized splendid architectural landmarks demonstrates how Germans, even in defeat, used links to past glory to help forge a new, postwar German identity.

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**JONATHAN NUFABLE, ELECTRICAL ENGINEERING**

Title: *Preliminary Performance Tests of a Wireless Body Balance Measurement Device*

Faculty Mentor: Dr. George Kondraske

Telemedicine is providing remote clinical services by real-time, two-way communication between a patient and their clinician. By eliminating the need for the patient to be physically present for examination, this opens a flexible range of applications to a variety of fields to not only just medicine but also medical research. One example is the examination of a patient's postural stability. However, most medical screenings involve visual observations. To alleviate potential variances between examiners and provide accurate readings of the patient's stability, a wireless Postural Stability Sensor Unit (PSSU) device has been developed. It will calculate a percentage stability from measuring the patient's roll, pitch, and yaw as they maintain a stable posture at different scenarios (Eyes open vs. Closed, Both Legs vs. Single Leg, etc.). Preliminary validation of the system will determine if it will be possible to [proceed to future human testing and](#) later replace traditional medical screening.

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**ANHKIM PHO, PSYCHOLOGY**

Title: *Social Media and Mood—Difference in Smartphone Use and Anxiety*

Faculty Mentor: Dr. Angela Dougall

Social media use is steadily rising, along with levels of anxiety and other mental illnesses. This study investigated 1) whether there was a relationship between social media, smartphone use, and anxiety and 2) whether gender moderated these relationships. Questionnaire data were gathered from 100 university students and correlations were examined. Greater Twitter use and phone calling was associated with less interaction anxiety. However, texting was associated with more trait, state, and shared content anxiety. Additionally, there may be gender discrepancies in smartphone use; within females, more texting was related to greater trait and state anxiety and more calling was related to less interaction anxiety. Whereas males were more active on YouTube, which was associated with greater social interaction, privacy concern, interaction, and self-evaluation anxiety. Therefore, females may use texting as a way to cope with anxiety. In contrast, the use of platforms like YouTube may increase anxiety among males.

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**ELIZABETH SCHNEIDER, NURSING**

Title: *A Retrospective Chart Review Comparing Nutritional Screening Tools (MNA-SF and MUST) in Identifying Malnutrition in Older Adults Admitted to the Hospital in 2016*

Faculty Mentor: Dr. Deborah Behan

There are many factors that contribute toward negative outcomes in the healthcare setting for hospitalized older adults. One of these factors includes meeting nutritional requirements. Unfortunately, many cases of malnutrition in patients 65 years and older, who are admitted to the hospital, go unnoticed due to the lack of nutritional screening tool implementation. Therefore, this study looks at two of the most popular nutritional screening tools, the MNA-SF and MUST, to identify malnutrition in older adults with a preexisting diagnosis of malnutrition or failure to thrive in order to evaluate their effectiveness. Through this study, it was found that the MNA-SF screening tool consistently identified 100% of patients with either risk-for malnutrition or current malnourishment while the MUST screening tool only identified 60% from the same sample size of 30 patients.

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**ELIZABETH STEPHENSON, MATHEMATICS**

Title: *Tangible Topology through the Lens of Limits*

Mentor: Dr. Barbara Shipman

Point set topology is perhaps the most abstract branch of mathematics in that it lacks tangible notions of distance and length, size, magnitude, and ordering. There is no curvature or shape, no geometry, no algebra, no direction. Everything we are used to visualizing is gone. We have only a set of points, and open subsets of it, governed by three simple axioms. With only this minimal structure, we can define limits of sequences, a vital element at the heart of mathematics. We examine the essence of topological worlds through the lens of limits, thereby creating new visual perceptions of unfamiliar things. Our investigations reveal fascinating questions that guide our thinking as we extract core properties that make topology come alive in a tangible way.