PROGRAM AND ABSTRACTS

Wichita State University

Sixteenth Annual

UNDERGRADUATE RESEARCH AND
CREATIVE ACTIVITY FORUM—URCAF

APRIL 5, 2016
HUGHES METROPOLITAN COMPLEX
2016 URCA FORUM

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(Social Sciences)
Sayed Farid, Student Member

Sponsors:
Office of Academic Outreach
College of Business
College of Fine Arts
College of Health Professions
Graduate School
SCHEDULE

9:00 am – 9:30 am: Registration, Hughes Metropolitan Complex, Rm 132
9:30 am – 12:00 pm: Oral Presentations

- Social Sciences and Humanities, Hughes Metropolitan Complex, Rm 138
- Natural Sciences and Engineering, Hughes Metropolitan Complex, Rm 130

10:00 am – 12:00 pm: Poster Presentations, Hughes Metropolitan Complex, Rm 132
12:00 – 1:30 pm: Lunch, Hughes Metropolitan Complex, Rm 180
1:30 – 2:00 pm: Awards Ceremony, Hughes Metropolitan Complex, Rm 138
### Social Sciences and Humanities Oral Presentations

**Hughes Metropolitan Complex Room 138**

<table>
<thead>
<tr>
<th>Presentation Time</th>
<th>Presenter’s Name</th>
<th>Presentation Title</th>
<th>Abstract Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:30</td>
<td>Rebecca Pedrazzi</td>
<td>Stereotypes and Gender Role in TV Commercials: A Media Report</td>
<td>7</td>
</tr>
<tr>
<td>9:45</td>
<td>Naquela Pack</td>
<td>Fiscal Policies Impact on Inequality: Loss to Human Development</td>
<td>8</td>
</tr>
<tr>
<td>10:00</td>
<td>Emily Matta</td>
<td>The First Americans: Native American Voting Behavior Today</td>
<td>8</td>
</tr>
<tr>
<td>10:15</td>
<td>Erin Nisly</td>
<td>Political Polarization in the United State House of Representatives</td>
<td>8</td>
</tr>
<tr>
<td>10:30</td>
<td>Alissa Bey</td>
<td>The Role of Skin Complexion on African American Emerging Adults</td>
<td>7</td>
</tr>
</tbody>
</table>

### Natural Sciences and Engineering Oral Presentations

**Hughes Metropolitan Complex, Room 130**

<table>
<thead>
<tr>
<th>Presentation Time</th>
<th>Presenter’s Name</th>
<th>Presentation Title</th>
<th>Abstract Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:30</td>
<td>Marcus Berndt</td>
<td>Fabrication and Characterization of Crosslinked Microspheres Encapsulating Neural Cells for Neural Regeneration</td>
<td>9</td>
</tr>
<tr>
<td>9:45</td>
<td>Martina Salerno</td>
<td>Laser Surface Modification of the Orthopedic Bio-metal, Cobalt Chromium Alloy</td>
<td>9</td>
</tr>
<tr>
<td>10:00</td>
<td>Logan Pohl</td>
<td>Measuring the Effects of Mutations to Non-Conserved Amino Acids in lactate Dehydrogenase</td>
<td>10</td>
</tr>
<tr>
<td>10:15</td>
<td>Jessica Gayle</td>
<td>Validation of a Dynamic Electrochemical Apparatus Within In-Vitro Conditions</td>
<td>11</td>
</tr>
<tr>
<td>10:30</td>
<td>Khoi Lam</td>
<td>Differences in Human Gait While Carrying a Load at Different Positions on the Back</td>
<td>11</td>
</tr>
<tr>
<td>10:45</td>
<td>Ehiremen Omoarebun</td>
<td>Attitude Dynamics of an All-Electric Spacecraft</td>
<td>12</td>
</tr>
<tr>
<td>11:00</td>
<td>Alec Richardson</td>
<td>A Computational Model of Electroactive Polymer Assisted Left Ventricular Contraction</td>
<td>12</td>
</tr>
<tr>
<td>11:15</td>
<td>Cooper Colglazier</td>
<td>Exploration of High Density STT-RAM Design</td>
<td>13</td>
</tr>
</tbody>
</table>
## Natural Sciences and Engineering Oral Presentations

### Hughes Metropolitan Complex Room 130

<table>
<thead>
<tr>
<th>Presentation Time</th>
<th>Presenter’s Name</th>
<th>Presentation Title</th>
<th>Abstract Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:30</td>
<td>Ryan Becker</td>
<td>Identification of Intracellular to Extracellular Chemical Variations of Inhibitory Cell Function in Muscle Cell Pathology</td>
<td>13</td>
</tr>
<tr>
<td>11:45</td>
<td>Hooloomann Ramdial</td>
<td>Orbits for a Deep Space Dark Matter Search Experiment</td>
<td>14</td>
</tr>
<tr>
<td>12:00</td>
<td>Stanislav Karpuk</td>
<td>A User-Friendly Numerical Simulator of High-Speed Flow</td>
<td>14</td>
</tr>
<tr>
<td>12:15</td>
<td>Jasmine Mayorga</td>
<td>pH Sensitive Conformational Change Monitored by Tryptophan</td>
<td>15</td>
</tr>
<tr>
<td>12:30</td>
<td>Samuel Richardson</td>
<td>Efficency of Cylindrical Close to the Sun Neutrino Detectors</td>
<td>15</td>
</tr>
</tbody>
</table>

## Social Sciences and Humanities (UPSSH) Poster Presentations

### Hughes Metropolitan Complex Room 132

<table>
<thead>
<tr>
<th>Presentation Name</th>
<th>Presenter’s Name</th>
<th>Presentation Title</th>
<th>Abstract Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPSSH1</td>
<td>Thao Nguyen</td>
<td>Examination of the Effect of Allicin on the Growth of Staphylococcus Aureus in Culture</td>
<td>16</td>
</tr>
<tr>
<td>UPSSH2</td>
<td>Anna Wray</td>
<td>A Qualitative Study of Woman’s Informal Sources of Information About Preconception Health and Care</td>
<td>16</td>
</tr>
<tr>
<td>UPSSH3</td>
<td>Tyler Cassity</td>
<td>The Effects of Implementing a Daily Classroom Management Strategy</td>
<td>17</td>
</tr>
<tr>
<td>UPSSH4</td>
<td>Sascha Khan</td>
<td>Characterizing Bacterial Tolerance to Iron Sulfate</td>
<td>17</td>
</tr>
<tr>
<td>UPSSH5</td>
<td>Clara Davidson</td>
<td>Promoting Children’s Social Emotional Development Through Classroom Consultation</td>
<td>17</td>
</tr>
<tr>
<td>Presentation</td>
<td>Presenter’s Name</td>
<td>Presentation Title</td>
<td>Abstract Page</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------</td>
<td>--------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>UPNSE1</td>
<td>Carissa Stover</td>
<td>Regulation of Recombinant Human Follicle Stimulating Hormone (RHFSH) Glycoform Production in GH3 Cells</td>
<td>18</td>
</tr>
<tr>
<td>UPNSE2</td>
<td>Jennifer Mattar</td>
<td>Promoting Health Through Mass Media: Lessons Learned From a Pilot Assessment of Student Ebola Perceptions</td>
<td>18</td>
</tr>
<tr>
<td>UPNSE3</td>
<td>Shelby Verble</td>
<td>Acoustics of Speech Production in Young Children with Autism Spectrum Disorder</td>
<td>19</td>
</tr>
<tr>
<td>UPNSE4</td>
<td>Haley Johnston</td>
<td>Improving Speech Data Collection When Diagnosing Autism Spectrum Disorder: Problems and Solutions</td>
<td>20</td>
</tr>
<tr>
<td>UPNSE5</td>
<td>Alisha Stevenson</td>
<td>Breathing and Vocalization Patterns in Young Children with Autism Spectrum Disorder</td>
<td>20</td>
</tr>
<tr>
<td>UPNSE6</td>
<td>Taylor Peck</td>
<td>Use of Music with Alzheimers Patients: The SLP Perspective</td>
<td>21</td>
</tr>
<tr>
<td>UPNSE7</td>
<td>Sushrutha Nagaraj</td>
<td>Study of Biocompatibility and Biomechanical Properties of Composite Scaffolds for Bone Repair</td>
<td>21</td>
</tr>
<tr>
<td>UPNSE8</td>
<td>Moheimin Khan</td>
<td>Design and Manufacture of End-Caps for a Chemical Vapor Deposition System to Grow Carbon Nanotubes</td>
<td>22</td>
</tr>
<tr>
<td>UPNSE9</td>
<td>Maddison Downs</td>
<td>Helping Professions: Student Characteristics Leading to Choice of Major</td>
<td>22</td>
</tr>
<tr>
<td>UPNSE10</td>
<td>Jessica Aldrich</td>
<td>Electromagnetic Resonant Bone Health Sensor Patch for Detection of Osteoporosis</td>
<td>23</td>
</tr>
<tr>
<td>UPNSE11</td>
<td>Jerad Rogers</td>
<td>Quantification of Arterial Electromagnetic Properties for Peripheral Artery Disease Screening</td>
<td>23</td>
</tr>
</tbody>
</table>
The Role of Skin Complexion on African American Emerging Adults

Abstract: Past literature exploring the role of skin complexion within the African American community has produced conflicting results (Maxwell, Brevard, Abrams, Belgrave; 2015). The current study uses a mixed-method approach to expand on this literature by exploring the experiences of African American emerging adults and their perceptions on how skin complexion has shaped their lives. Data will be collected using a brief survey to gather information about the participants’ well-being and information regarding their own skin complexion. Focus groups will be conducted to further explore participants’ life experiences regarding skin complexion and how they believe it has shaped their experiences in emerging adulthood. A T-test will be run to assess the relationship between self-rated skin complexion, satisfaction with skin complexion and well-being measures. The information relayed by the participants during the focus group will be transcribed and coded to reveal any common themes surrounding their experiences with skin complexion. We hypothesize that common themes of lower well-being, dissatisfaction with skin complexion, and negative experiences based on skin complexion in emerging adulthood will be arise more often from individuals who self-rate their skin complexion at the very light or very dark end of the spectrum, more so than individuals that self-rate their skin complexion as medium. Future research and implications will be discussed.

Stereotypes and Gender Role in TV Commercials: A Media Report

Abstract: Gender stereotypes are gaining a great amount of importance when it comes the time of defining the role of men and women in a family context. Even if most of the population tend to believe that equality of marriage is a common path in 2016, this is not true for what is shown on TV commercials. My analysis displays how high level of sexism, androcentrism and subordination of the female counterpart are still vivid nowadays. Through the analysis of three variables such as 'house and childcare', 'cooking and providing food' and 'having fun in the house environment' I will try to show how gender stereotypes are a main theme in commercials.
Naquela Pack
Faculty Mentor: Dinorah Azpuru
Fairmount College of Liberal Arts and Sciences
Social Sciences and Humanities Oral Presentations

**FISCAL POLICIES IMPACT ON INEQUALITY: LOSS TO HUMAN DEVELOPMENT**

**Abstract:** Inequality can be determinant to quality of life. My research project examines what conditions explain a high percentage of loss to human development due to inequality in countries around the world. The Human Development Index (HDI) represents the quality of life in different countries (education, life span and income per capita). However the HDI decreases when adjusted for inequality. I analyze the variables that explain why some countries have a higher percentage loss due to inequality. My main independent variable is the tax revenue as a percentage of the GDP and I control for the level of human development of each country and the level of globalization, which according to the literature can influence inequality. I will perform multiple regression analysis using aggregate data that I entered myself in a dataset of 191 countries.

Emily Matta
Faculty Mentor: Dinorah Azpuru and Neal Allen
Fairmount College of Liberal Arts and Sciences
Social Sciences and Humanities Oral Presentation

**THE FIRST AMERICANS: NATIVE AMERICAN VOTING BEHAVIOR TODAY**

**Abstract:** Among the most critically neglected ethnicities when studying political behavior, Native Americans are often lumped into the ‘Other’ category in national surveys and resulting datasets. Composing a rather small but unarguably important demographic, this absence of information has rendered studying Native American political participation notoriously difficult. By utilizing survey data from GSS2012, and identifying ethnicity variables that include Native Americans, I intend to analyze Indian electoral participation in the 2008 presidential election to shed light on how many Native citizens vote and what circumstances may affect how they vote. Do Native Americans vote with the same frequency as white voters? Why not? I hypothesize that Native Americans are less mobilized not only because of education and economic disparities, but because of a lack of trust in the United States federal government. If proven true, initiatives like President Obama’s Gen-I (Generation Indigenous) might improve the relationship between Native Americans and the federal government over time and subsequently increase voter turnout.

Erin Nisly
Faculty Mentor: Melvin A. Kahn
Fairmount College of Liberal Arts & Sciences
Social Sciences and Humanities Oral Presentation

**POLITICAL POLARIZATION IN THE UNITED STATE HOUSE OF REPRESENTATIVES**

**Abstract:** This paper seeks to explain the increased political polarization that has occurred within the United States Congress. A brief history of political leadership within Congress is supplied, along with how party affiliation has evolved, and how the Southern Realignment affected the political landscape of the 21st century. This literature review provides a series of basic causalities for increased political polarization. To begin, I analyze the general shift of political parties and individuals from the center, how the ideological divide has widened over time and what this does to increase polarization and governmental effectiveness. Next, procedural tools and voting schemes within Congress are examined to
determine the extent they have affected polarization. Campaign finance laws, tightening margins during elections, and the shift from candidate-centered elections to party systems are assessed also. I briefly analyze issue dimensionality and the idea that the polarization trend could be better understood on an issue-by-issue basis. Religiosity, leaders, small donators, and constituents are other areas considered, for a better understanding of the growing political polarity seen in the U.S. Congress today.

Marcus Berndt  
Faculty Mentor: Li Yao  
Co-Authors: Li Yao  
Fairmount College of Liberal Arts & Sciences  
Natural Sciences and Engineering Oral Presentations

FABRICATION AND CHARACTERIZATION OF CROSSLINKED MICROSPHERES ENCAPSULATING NEURAL CELLS FOR NEURAL REGENERATION

Abstract: Astrocytes are the most abundant glial cells in central nervous system. They play a critical role in supporting the normal physiological function of neurons in the spinal cord. Astrocytes generate multiple neurotrophic factors that regulate survival, proliferation, and differentiation of neurons. It has been identified that astrocytes are a population that is necessary in the repair of spinal cord injury (SCI) with crucial functions for axonal regrowth. Recent studies revealed that astrocyte transplantation can promote axonal regeneration and functional recovery after SCI. Biomaterial can be designed as a growth-permissive substrate and serve as a carrier for therapeutic cell transplantation into an injured spinal cord. The objective of this study is to develop crosslinked collagen microspheres, which serve as a carrier for gene modified astrocytes for the treatment of neural tissue injury. / We established a method to fabricate collagen microspheres, which were crosslinked with Poly(ethylene glycol) ether tetrasuccinimidyl glutarate (4S-StarPEG). Degradation study showed longer degradation time for spheres with higher amounts of crosslinker. The viability of the cells in the microspheres was higher than 90%. Astrocytes transfected with plasmids encoding EGFP-NGF genes were grown into the microspheres. The expression of EGFP and NGF by the cells in the spheres was determined by microscope and ELISA assay respectively. The cultured rat DRG treated with microspheres containing transfected astrocytes showed enhanced axonal growth. In this initial study we have shown that the microspheres can be used as a carrier of genetically modified cells to facilitate nerve regeneration.

Martina Salerno  
Faculty Mentor: Anil Mahapatro  
College of Engineering  
Natural Sciences and Engineering Oral Presentation

LASER SURFACE MODIFICATION OF THE ORTHOPEDIC BIO-METAL, COBALT CHROMIUM ALLOY

Abstract: Post-surgical site infections are common after medical implant placement. Infections in tissue surrounding an implant can cause patient suffering, medical device failure, and can potentially spread systematically. Post-operative infection associated with orthopedic implants is a critical and escalating problem which demands urgent attention for a decrease of occurrences. Implant related infections can require a patient to undergo additional surgeries following the initial implant placement surgery. Another challenge that exists for implant placement, due to orthopedic injuries, is tissue integration. Each year, there are more than 30,000 revision surgeries partially due to poor orthopedic implant fixation with bone. In order to combat infection, biomaterials and functional coatings used for medical implants are evaluated either for their ability to resist infection (resist bacterial adhesion and biofilm formation) or for their
ability for tissue integration (to support tissue cell adhesion and proliferation). No viable clinical
technology currently exists to address both these issues simultaneously. Our hypothesis is that laser
micro-nano machining can create surface topographies on orthopedic implant surfaces that could provide
a platform for simultaneous tissue integration and therapeutic delivery for biofilm prevention. This study
explores the role of laser micro-nano machining in creating surface topographies on an orthopedic
relevant bio-metal, cobalt chromium (Co-Cr) alloy. Co-Cr alloys are extensively used for orthopedic and
dentistry applications. Laser modified Co-Cr samples were compared to other laser modified bio-metals,
such as titanium. Co-Cr alloy and Ti were cut into 1cm x 1cm squares and were then modified using a
nanosecond pulsed laser. A CoherentTM Avia 355X nanosecond pulsed laser with pulse energy of 95 µJ,
spot size of 130 µm, line width of 100 µm, scan rate of 200 mm/min, and repetition rate of 20 kHz was
used to raster scan the coupons with an overlap of 23%. A lens with a focal length of 10 cm was used for
the experiments with the actual experimentation done at a defocused distance of 0.5 mm. Bare metal
(control) and surface modified samples were characterized using optical microscopy and scanning
electron microscopy (SEM). Optical and SEM results clearly show a radically different surface
morphology for laser patterned samples when compared to control samples. Since laser parameters were
kept constant, response varied for each material type. At 300X magnification, SEM results clearly show a
~100 µm width of the raster patterned zone of varying geometry. Ti seems to have a more uniform
surface pattern when compared to Co-Cr alloy suggesting a need to further optimize Co-Cr alloy laser
parameters. In summary, our results demonstrate the effect of laser treatment in creating micro-nano
structured surface topographies on Ti and Co-Cr alloy which can be subsequently modified to address
current orthopedic clinical needs.

Logan Pohl
Faculty Mentor: Moriah Beck
Co-Authors: Dami Alao
Fairmount College of Liberal Arts & Sciences
Natural Sciences and Engineering Oral Presentation

MEASURING THE EFFECTS OF MUTATIONS TO NON-CONSERVED AMINO ACIDS IN
LACTATE DEHYDROGENASE

Abstract: Lactate dehydrogenase (LDH) catalyzes the interconversion of lactate and pyruvate and this
enzyme is found in cells from nearly all organisms. Although this protein has a highly conserved
sequence, it is known to have several non-conserved amino acids that vary between species. Recent
research has suggested that substitutions at non-conserved positions behave more like rheostats in
modulating protein function gradually, whereas substitutions at conserved positions result in “toggle
switching” by turning activity on or off. We decided to address this dichotomy by identifying residues in
LDH that vary among closely related species of barracuda. We used bioinformatics techniques to measure
protein properties, then made mutations at two sites to two different residues. These mutated proteins
were expressed and purified so that we could compare the enzymatic rate constant and stability of the
mutant protein to wild-type LDH. Circular dichroism was used to monitor secondary structure loss
during thermal denaturation. Enzyme kinetic parameters were obtained from a kinetic assay that
measures formation of NADH, an LDH substrate, which absorbs light at 340 nm unlike the precursor
NAD+. Thermal denaturation curves indicated significant shifts in the melting temperature, indicating
differences in the stability for the mutations when compared to the wild type. We will also measure the
kinetic rates for these mutant proteins, which will also indicate to what degree these non-conserved
regions serve as rheostats for LDH. Finally, other single mutations and double mutations will be made
and tested using the same mechanisms.
VALIDATION OF A DYNAMIC ELECTROCHEMICAL APPARATUS WITHIN IN-VITRO CONDITIONS

Abstract: Biodegradable metals are being considered as potential next-generation cardiovascular stent implant materials for their mechanical and biodegradable properties. In order to better understand how biodegradable metals corrode in vivo, it is important to simulate a similar environment that would be experienced by the metal. Current mass loss or static electrochemical methods do not accurately simulate the dynamic flow conditions as encountered in coronary arteries. A dynamic electrochemical corrosion test apparatus was designed in our laboratories to simulate in-vivo conditions, which a stent would encounter. Experiments were conducted to validate the developed corrosion test apparatus. The electrochemical corrosion of 316L SS was tested in a pseudo-physiological fluids: PBS, Hanks, and Modified Eagle’s Medium, at steady 37 degrees Celsius. A range of fluid velocities were passed over the 316L SS metal sample while electrochemical corrosion tests were performed. The dynamic corrosion rates were determined under static (no flow), 100 RPM, 200 RPM, 300 RPM, and 400 RPM conditions and compared to the rate obtained in a the standard electrochemical corrosion test bench. Results indicated that the static velocities results of standard corrosion apparatus and the developed test apparatus were close in comparison. As the fluid velocities were increased from 100 RPM through 400 RPM, corrosion rates deviated from the static corrosion values; however no particular trend was observed. By evaluating the accuracy of this dynamic test bench, a better understanding of the need of optimization was concluded. Once future optimization is achieved, one will be able to see how potential cardiovascular stent materials may potentially degrade within the human body.

DIFFERENCES IN HUMAN GAIT WHILE CARRYING A LOAD AT DIFFERENT POSITIONS ON THE BACK

Abstract: Most people are introduced to backpacks when they are students. As they age, these bags usually grow in terms of size and load. This study sought to determine the differences in human gait patterns when individuals walk with and without a weighted backpack. In addition to backpack weight changes, the effect of weight height location on the back was also examined. The hypothesis for the study was that differences in gait kinematics would be noticeable as weight of the load and position of the backpack changed. Data were collected from 10 subjects as they walked with no weight in a backpack, 17% of their body weight (BW) in the backpack placed high on their back, and 17% BW in the backpack placed low on their back. Video analysis was used to determine gait patterns, specifically leg joint angles,
as subjects walked on a treadmill under the three different conditions. The results did not indicate significant differences in hip, knee, and ankle angles across the three walking conditions measured. The absence of observed differences in leg joint angles may be due to the weight used in the study, which was representative of a heavy load of books, and the use of a treadmill. The relatively low weight may not have necessitated changes in walking patterns. Additionally, the use of a treadmill resulted in the subjects walking at a constant speed for all three conditions, which might have been a dominant factor affecting the gait patterns.

Ehiremen Omoarebun
Faculty Mentor: Atri Dutta
College of Engineering
Natural Sciences and Engineering Oral Presentation

ATTITUDE DYNAMICS OF AN ALL-ELECTRIC SPACECRAFT

Abstract: Most Geostationary Orbit (GEO) satellites are hybrid which use both chemical and electric propulsion. The use of an all-electric propulsion system on a satellite is not yet common. Electric Propulsion involves accelerating a propellant using electrical power obtained from the solar arrays of a satellite. This research focuses on the attitude dynamics of large all-electric satellites with varying moment of inertia over time. In March 2015, the first two all-electric satellites were launched on Space X’s falcon 9 rocket, and both became fully operational before the end of the year. A spacecraft with electric propulsion can deliver a larger payload fraction compared to one with a traditional chemical propulsive system. However, it takes a longer time for an all electric spacecraft to execute an orbital transfer due to its extremely low thrust level. In terms of launch and operational cost, using electric propulsion is way cheaper as it allows a smaller launch vehicle to be used. The equations of the rotational dynamics of a satellite will be simulated into MATLAB using the Hall thruster as a method of propulsion to see the effect of changing mass of the satellite as it thrusts continuously in orbit. The satellite attitude in relation to the concept of perturbed space and body cones will also be analyzed.

Alec Richardson
Faculty Mentor: Kim Cluff
College of Engineering
Natural Sciences and Engineering Oral Presentation

ACOMPUTATIONAL MODEL OF ELECTROACTIVE POLYMNER ASSISTED LEFT VENTRICULAR CONTRACTION

Abstract: Left ventricular systolic dysfunction (LVSD) is classified as asymptomatic heart failure and is the most common cause of heart failure comprising about 60 percent of patients. LVSD is associated with reduced left ventricle (LV) contractility, and can therefore be diagnosed in patients with a reduced ejection fraction (EF). The purpose of this research is create and analyze three separate computational models of LV contraction. One model will illustrate normal LV contraction while another model will show LV contraction with systolic dysfunction. The third model will show restoration of normal LV contraction by incorporating a ventricular assistive device (VAD) into the model made from electroactive polymers. The three models will be set up in COMSOL Multiphysics 4.4 using the Fluid Structure Interaction (FSI) and MEMS modules. Currently, only the model illustrating normal LV contraction is being considered. To reduce computing time, the left ventricle is modeled in 2D, and the geometry is consistent with end-diastole LV dimensions. Material properties for both the blood and myocardium were
found from literature. Additionally, initial conditions and most boundary conditions were determined through literature. The model is being computed using a time-dependent study, allowing transient analysis of the fluid-structure interaction. After computing the results, a measurement tool in COMSOL will be used to determine the end-diastole and end-systole areas. Using these measurements, the EF will be determined for each of the three models. Normal EF values range from 55-75% and an EF of less than 40% is generally diagnosed as heart failure. Overall, a successful model will show the electroactive polymer assisting in the contraction of the left ventricle while restoring normal EF values. This research is a foundation for emerging technologies that will give hope to those with LVSD and heart failure.

Cooper Colglazier
Faculty Mentor: Ali Eslami and Preethika Kumar
Co-Authors: Ali Eslami and Preethika Kumar
College of Engineering
Natural Sciences and Engineering Oral Presentation

EXPLORATION OF HIGH DENSITY STT-RAM DESIGN

Abstract: The next generation of high performance computing will call for ultra high speed, low power machines that occupy smaller physical space. One path to these important goals is to greatly improve memory and storage in modern computers. Currently, computing relies on flash or disk for long term storage and DRAM or SRAM for information that needs to be accessed faster. Each of these come with a range of problems and will soon reach the theoretical limits of operation. Emerging solid-state non-volatile memory technologies like Spin Transfer Torque Random Access Memory (STT-RAM) are in position to replace prevailing memory schemes. STT-RAM, a high speed, high endurance, nanoscale memory device stores information in the magnetization direction of a thin nanomagnet. STT-RAM’s simple architecture and performance advantages combine to form a great alternative to current technology. The primary challenge still plaguing STT-RAM is the density of cells per square area measured in Giga bits per centimeter squared (Gb/cm2). To achieve higher densities, we must reduce transistor size and therefore reduce the electric current used to change (write) information in the STT-RAM cell. Lowered current will in turn cause problems with thermal stability of the cell or slower read and write times. The thermal stability characterizes the tendency of thermal fluctuations to randomize the magnetization direction of the nanomagnet, and thus the storage lifetime of the memory cell. In this research, we find creative solutions for achieving acceptable thermal stability and fast write and read operations while keeping the smallest possible STT-RAM cell size. This will include investigating new design approaches like replacing the bulky traditional transistor in the cell with a spin-current transistor, thus creating an all-spin memory device. Any models designed will be verified using National Institute of Science and Technology’s open source Object-Oriented Micromagnetic Framework software.

Ryan Becker
Faculty Mentor: Kim Cluff
Co-Authors: Kim Cluff
College of Engineering
Natural Sciences and Engineering Oral Presentation

IDENTIFICATION OF INTRACELLULAR TO EXTRACELLULAR CHEMICAL VARIATIONS OF INHIBITORY CELL FUNCTION IN MUSCLE CELL PATHOLOGY

Abstract: Peripheral Artery disease (PAD) is a condition that causes a progression in ischemic injury to the muscles, nerves, blood vessels, skin and subcutaneous tissues of the leg. Biomedical research on human PAD muscle biopsies has suggested that changes in metabolic processes, organelles, and bioenergetics are primary factors in ischemic skeletal muscle damage. The objective of this study was to
optically probe damaged muscle tissue and identify novel micro-spectral biomarkers that could characterize the intracellular and extracellular biochemical alterations in the diseased muscle. Tissue collected from a prior study of a hindlimb ischemia murine model was harvested from the gastrocnemius muscle of both control and ischemic limbs in eight mice. The harvested muscle samples were optically probed using Raman micro-spectroscopy, and statistical analysis of the muscle tissue spectra was conducted, including a paired t-test, principal component analysis and discriminant analysis to identify significant spectral peaks. Raman micro-spectral analysis of the muscle tissue produced distinct molecular profiles for both control and ischemic samples. Significant differences (p<0.05) in spectral peaks were found in the fingerprint region of the spectra using a paired t-test. Fisher's Linear Discriminant analysis on the first principal component and was able to correctly classify the ischemic and control muscle tissue with 100% accuracy. Unique spectral biomarkers found in damaged muscle may provide novel insight and direction to identify new therapeutic targets to arrest muscle degeneration following ischemic conditions. Further, these spectral biomarkers may be used as surrogate endpoints to assess and predict the effectiveness of a therapeutic intervention.

Hooloomann Ramdial
Faculty Mentor: Atri Dutta
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Natural Sciences and Engineering Oral Presentation

ORBITS FOR A DEEP SPACE DARK MATTER SEARCH EXPERIMENT

Abstract: Dark matter search experiments have been of great interest to scientists. In this research project, a probe is to be sent to the planet Jupiter in order to detect dark matter. Being the biggest planet in the Solar System, the effects of Jupiter’s gravity field is to be thoroughly analyzed before considering a final orbit around the giant planet. In order to look for dark matter in the neighborhood of Jupiter and perform additional scientific investigations, the spacecraft may need to change its orbital inclination relative to Jupiter. Naturally occurring gravitational perturbations due to Jupiter’s gravity field can be used to our advantage since the inclination of an orbit around Jupiter will tend to change over time. This will help minimize the use of fuel onboard the spacecraft to perform plane changes. Jupiter’s radiation belts can have undesired effects on the probe. Hence, the latter is to be kept as far away as possible from the planet while performing the experiment. A set of possible orbits around Jupiter are calculated based on the perigee and eccentricity variations. Orbits in which a plane change of 30° in 3 equal steps can be performed using a maximum ΔV budget of 500 m/s were chosen. Several of those orbits were analyzed using NASA's GMAT tool and compared with codes written in MATLAB to observe how the inclination varies over time. Rigorous analysis of mission scenarios demonstrate that highly eccentric orbits with a large semi-major axis tend to satisfy the ΔV budget typical of NASA's space missions.

Stanislav Karpuk
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Natural Sciences and Engineering Oral Presentation

A USER-FRIENDLY NUMERICAL SIMULATOR OF HIGH-SPEED FLOW

Abstract: Computational fluid dynamics (CFD) has become an important and relatively efficient method of simulating complex aerodynamic phenomena. Many CFD tools have been developed to simulate and visualize different flow characteristics. Supersonic and hypersonic flow lie in the field of problems that have no theoretical solution for many flow cases, therefore CFD becomes a useful tool. However, access and utility of modern CFD solvers for high-speed flow have certain problems: codes are either expensive or, if they are available free, require other tools for post-processing and are not easy to use. This work
presents an open-source MATLAB 2-D code that simulates inviscid supersonic and hypersonic flow around arbitrary shapes. The goal of the tool is to provide relatively quick, easy to use, and accurate visualization of high-speed flow phenomena for educational purposes. The hypersonic flow regime includes an equilibrium flow model to ensure more accurate flow simulation at high Mach numbers. Results for circular cylinder simulation show high accuracy compared to experimental data and modern commercial software.

**Jasmine Mayorga**  
Faculty Mentor: Jim Bann  
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Natural Sciences and Engineering Oral Presentation

**pH SENSITIVE CONFORMATIONAL CHANGE MONITORED BY TRYPTOPHAN**

**Abstract:** Anthrax toxins are the main virulence component in bacterium Bacillus anthracis, a lethal agent for livestock and humans. Bacillus anthracis is composed of several polypeptide chains: the receptor-binding moiety protective antigen (PA) and Enzymatic moieties lethal factor (LF) and edema factor (EF) (Pilpa, Bayrhuber, Marlett, Reik, & Young, 2011). This study examines the PA membrane and the expanding pores with emphasis on the mechanism of the pre-pore to pore formation of antibody MAB350. The fluorospectrometer reading was used to measure the effects of the pH on the two proteins. While the kinematics approach was used to measure the rate of transition from pre-pore to pore. Recent findings suggest that PA intermediates as mechanisms for pre-pore to pore formation. The details of how PA pre-pore to pore intermediates and translocates toxins are not yet known. The research explored the pH stability of Protective Antigen to figure the conformational changes on the PA. The results of this study will give scientists a better understanding of Anthrax toxins, with the data contributing to the development of a potential cure.

**Samuel Richardson**  
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Natural Sciences and Engineering Oral Presentation

**EFFICIENCY OF CYLINDRICAL CLOSE TO THE SUN NEUTRINO DETECTORS**

**Abstract:** The Sun of our solar system is the source of almost all the energy and the sustainer of all life in our universe and yet very little has been measured beyond what little of the sun can be penetrated by visible light and then be seen by our telescopes and satellites. It has been proposed by some here at WSU and at NASA to build a satellite that can see further into the sun, not using light, but by detecting neutrinos, tiny particles given off by the Sun's natural fusion processes to see all the way into the core of the sun to watch “up close” the fusion rates of the sun. For my research, I looked into the efficiency of cylindrical particle detectors of different masses and shapes and compared them to see how a potential future satellite mission could find a match for the needed efficiency of such a mission without requiring a detector that is cost prohibitive to launch into space. This research was done using a Monte Carlo computer simulation for the sun's neutrino spectrum between 0.1-10 MeV where most of the neutrino events are and by using known path lengths of positrons (a by product of a neutrino collision with a nucleon) in Mineral Oil, a common solvent used in particle detectors and finding which particles are 90% or more contained within the detector's detecting area. My results show that a small detector close to the sun is a viable idea.
EXAMINATION OF THE EFFECT OF ALLICIN ON THE GROWTH OF STAPHYLOCOCCUS AUREUS IN CULTURE

Abstract: In order to explore the effectiveness of the garlic-derived chemical Allicin, we conducted inhibition assays on bacteriological plates using a commercially derived source of the chemical and also a freshly prepared solution. We incubated Staphylococcus aureus in the presence of these two sources of Allicin, commercially-acquired and freshly-prepared, and measured the size of their zones of inhibition. Our observations revealed that the zone of inhibition was much larger for the freshly-prepared solution of Allicin, compared to the commercially-acquired solution. These results suggest that a freshly prepared source of Allicin is much more effective at inhibiting the growth of Staphylococcus aureus than what can be obtained commercially.

A QUALITATIVE STUDY OF WOMAN'S INFORMAL SOURCES OF INFORMATION ABOUT PRECONCEPTION HEALTH CARE

Abstract: In the field of maternal and child health, there has been an increased focus on optimizing preconception care to address high rates of adverse birth outcomes. However, in response to a general lack of knowledge about preconception health care among women and physicians, many reproductive age women may be seeking out informal sources of health information to make decisions about their health. In our study, we examined women’s health information-seeking behaviors as it relates to preconception health care. We conducted a secondary analysis based on a qualitative focus group study sample consisting of 21 reproductive-age (18-44 years) women in South Central, Kansas. Our findings revealed that women relied on interpersonal (i.e., family, friends) and media sources (i.e., Internet) to obtain health information for making health decisions. Moreover, analyses revealed that participants’ actively seeking out health information was influenced by contextual factors such as perceived high health care costs and limited information received from physicians due to visit time restraints. Our findings suggest that public health professionals should consider preconception health education and promotion strategies that are social network and Internet-based. In addition, given time constraints, it will be important for health providers to identify new strategies to optimize the provision of preconception care and information sharing with women.
THE EFFECTS OF IMPLEMENTING A DAILY CLASSROOM MANAGEMENT STRATEGY

Abstract: The purpose of this study was to identify the effects of using a daily classroom management strategy on middle school students' behavior. This study took place over the course of two weeks in two separate seventh grade middle school classrooms receiving the same lessons. The classroom management strategy implemented in this study is known as CHAMPS. This is a common classroom management strategy used amongst school districts in order to limit off-task behaviors by setting clear expectations and directives for students during class activities. Over the course of the two weeks, one class went over CHAMPS expectations each day, before each activity, while the other class did not go over behavior expectations in any way. Each off-task behavior was recorded over this time. It was found that the amount of off-task behavior was significantly lower for the class of students presented with the CHAMPS expectations each day. The trend shows that off-task behavior was not only lower, but also decreased in frequency over the course of the two weeks.

CHARACTERIZING BACTERIAL TOLERANCE TO IRON SULFATE

Abstract: Spacecraft have detected evidence of liquid water near the surface of Mars. Given the low temperatures of this environment, liquid water is most likely present in the form of dense salty brines. While magnesium and calcium sulfates have been detected in large amounts in the Mars regolith, they have high eutectic temperatures (~270 K), suggesting that evaporation may reduce the likelihood of persistent water. Other salts, such as chlorates and perchlorates, are hygroscopic with low eutectic points, more suitable for this environment. However, these oxidizing salts appear to be harsh to biological organisms. It has been suggested that the most likely form of liquid water at the surface would be heavy brines of iron sulfate. This salt is widely present at the Martian surface and brines have a low eutectic point and water activity. The combination of low eutectic temperature and evaporation rates allows iron sulfate brines to be stable at high latitudes, where most gullies are found. Our objective is to create high-iron media and test growth tolerances, even at lower temperatures, for salinotolerant bacterial isolates. This work contributes to our understanding of the limits of life and the potential for life on Mars. Supported by NASA ROSES and KINBRE, P20GM103418

PROMOTING CHILDREN'S SOCIAL EMOTIONAL DEVELOPMENT THROUGH CLASSROOM CONSULTATION

Abstract: Setting up and executing effective interventions is important to the advancement of a classroom of children, particularly those who are at risk. The DECA-P2 was administered as a screening tool to five classrooms at community childcare centers. Children were categorized as “TYPICAL” or at
“NEED” based on their T scores on Total Protective Factors and Behavioral Concerns. Children in “NEED” received individualized behavioral interventions. All were rescreened to see how classroom consultation by a mental health specialist affected their social and emotional functioning. This study examines the differences between Pre and Post DECA-P2 scores for children in “NEED” compared to children who were “TYPICAL” at pretest. Those in “NEED” showed more improvements in protective factors and behavior concerns than their “TYPICAL” peers. The results support classroom consultation as an intervention to address individual children’s behavioral challenges while supporting the social and emotional development of all children in the classroom.

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Natural Sciences and Engineering Poster Presentation

REGULATION OF RECOMBINANT HUMAN FOLLICLE STIMULATING HORMONE (RHFSH) GLYCOFORM PRODUCTION IN GH3 CELLS

Abstract: FSH is a critical hormone for female reproduction. It is a heterodimeric glycoprotein composed of an α subunit that is common among other glycoprotein hormones, and a unique β subunit that confers specificity. Recent studies have suggested that two different forms of FSH exist, fully glycoslated FSH24 and hypoglycoslated FSH21/18. The glycoforms exhibit markedly different bioactivities and their relative abundance changes with age in women. To obtain sufficient hFSH glycoforms for experimental use, we utilized GH3 cells, rat somatotrophs transfected with human FSH α and β genes. The goal of this project was to find conditions/factors that would increase overall GH3 hFSH production and/or modulate the type of glycoform produced during culture. GH3 cells were cultured with treatments including P4, E2β, EGF, and insulin. Two culture medium serum formulations, horse and fetal bovine serum (FBS), were also compared. Following treatment, cells were counted and the media analyzed for FSH levels using a modified hFSH ELISA. GH3 cells produced increased levels of rhFSH in horse serum relative to FBS. EGF exhibited the most positive influence in rhFSH production. A key next step will be to test the additive effects of horse serum and EGF upon overall hFSH production and glycoform content. Difficulty was encountered while attempting to run Western blots for rhFSH glycoforms from the serum-containing media. Studies are currently underway to immuno-capture rhFSH prior to Western analysis. This work was made possible by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103418.

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PROMOTING HEALTH THROUGH MASS MEDIA: LESSONS LEARNED FROM A PILOT ASSESSMENT OF STUDENT EBOLA PERCEPTIONS

Abstract: Research Aim and Hypotheses / RQ1: For students in public health and communication, what are the media channels used for information public health concerns including EVD. / o H1a: When compared, there will be no statistically significant difference between graduate and undergraduate
students media channels used for information about public health issues including EVD. / / • RQ2: For
students in public health and communication, what is the level of knowledge about public health concerns
including EVD. / / o H1a: When compared, there will be a statistically significant difference between
graduate and undergraduate students knowledge of public health concerns including EVD. / /
Introduction: In recent months, public health officials and the media have focused on the Ebola virus
disease (EVD) (a.k.a. Ebola hemorrhagic fever (EHF)). The outbreak was defined as a Public Health
Event of International Concern by the Word Health Organization in August of 2014. There has been
debate about if the United States (U.S.) is currently prepared to face EVD, what U.S. policy should be
regarding travel and border control, and the level of concern the general population in the U.S. should
reasonable feel. This study is an assessment of student knowledge EVD and opinions about media
coverage of EVD. / / Methods: This was a pilot study with a cross-sectional survey and a convenience
sample. / / Results: Sixty-five college students participated in the survey and reported a low level of
basic knowledge of EVD, high health literacy levels, and Internet and health professionals as sources for
health information. / / Conclusion: This pilot study was an important first step to understanding students'
knowledge of Ebola, common sources of health information and health literacy levels. Results from this
study highlight the need to improve health communication training and further evaluate the quality of
health information dissemination via all communication sources.

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ACOUSTICS OF SPEECH PRODUCTION IN YOUNG CHILDREN WITH AUTISM
SPECTRUM DISORDER

Abstract: This study will explore the acoustics of speech production in young children with Autism
Spectrum Disorder (ASD). An important area in the discipline of communication sciences and disorders
is the diagnosis and treatment of children with ASD, but little is known about how children with ASD
control the acoustic output of their voices. We will use high-quality digital audio signals to identify,
measure, and analyze speech-related sounds by each child. We will measure the (a) fundamental
frequency (heard as pitch), (b) intensity (heard as loudness), and (c) duration (heard as length of time) of
each speech sound. We will determine whether there are significant differences in these three acoustic
measures (a) among children with ASD, and (b) between children with ASD and a control group of
children without ASD. Looking at individual comparisons, we predict that there will be significant
differences in acoustic measures among the children with ASD because the sound production of these
children is often idiosyncratic. Looking at group comparisons, we predict that children in the ASD group
will have less variability in their speech acoustics than the non-ASD children, because variability is an
indicator of prosody (or changes in how speech sounds are stressed) expected in typical speech
development. This would suggests that children are limited not only in the variety of their speech sounds,
but also in changes of pitch, loudness, and sound length. A better understanding of the speech output of
children with ASD might lead to insights related to early identification of speech disorders.
IMPROVING SPEECH DATA COLLECTION WHEN DIAGNOSING AUTISM SPECTRUM DISORDER: PROBLEMS AND SOLUTIONS

Abstract: The Wichita State University--Community Partners: Autism Interdisciplinary Diagnostic Team (WSU-CP: AIDT) is an interprofessional group that provides diagnostic services for young children and their families in Kansas who present with characteristics of Autism Spectrum Disorder (ASD). This team was developed for two purposes: (1) to train undergraduate and graduate students via a hands-on interprofessional education (IPE) model, to better recognize the characteristics of ASD, as well as screen, assess, and refer children with ASD; and (2) provide a highly needed service to children and families throughout South Central Kansas. An important part of the process is exploring the children’s speech and breathing behaviors to see how each child communicates, but many factors can negatively impact how this information is collected. We recorded speech output and respiratory movements from each child during diagnostic sessions. We identified three primary factors that negatively affect how the recordings can be used and studied: environmental noise, differences in children’s speech output, and movement artifact. We discuss what these factors are and ways that they can be managed. Diagnosing ASD is a complicated process, and clinicians need access to as much data as possible when making a diagnostic decision. Improving the diagnostic process benefits both families with children with ASD, and the clinicians who help them.

BREATHING AND VOCALIZATION PATTERNS IN YOUNG CHILDREN WITH AUTISM SPECTRUM DISORDER

Abstract: An important area in the discipline of communication sciences and disorders is the diagnosis and treatment of children with Autism Spectrum Disorder (ASD). Despite the umbrella term of ASD that is applied to children diagnosed with the disorder, each child presents with individual characteristics that make him or her unique. Both verbal and non-verbal children with ASD use the respiratory system to support sound production, but no-one to date has studied how they do this. The purpose of this research project was to explore breath support for vocalization in young children with ASD. Speech output and breathing behaviors were collected on children (ages 2 to 5 years) with diagnosed or suspected ASD. The recordings were part of a larger diagnostic process by WSU’s Autism Interdisciplinary Diagnostic Team (AIDT). Our pilot data show that the children with ASD show generally similar patterns to data from typically developing children, in two areas: (a) tidal breathing and speech breathing differ, and (b) breathing behaviors for different utterance types are variable. Speech breathing is one important aspect of speech production. More research is needed to determine how different breathing patterns support speech in children with ASD. Understanding speech breathing development might lead to early identification of young children at risk for ASD.
USE OF MUSIC WITH ALZHEIMER’S PATIENTS: THE SLP PERSPECTIVE

Abstract: Title: USE OF MUSIC WITH ALZHEIMER’S PATIENTS: THE SLP PERSPECTIVE / / Participants: Members of the Kansas Speech-Language Hearing Association who are Speech-Language Pathologists. Members were contacted via e-mail to voluntarily participate in this study. / / Affiliation: Department of Communication Sciences and Disorders---College Of Health Professions / / Text: The purpose of this study was to gain information about how music is being used with and if there is a benefit to using music for nursing home residents who have dementia (such as Alzheimer disease). A survey was composed of eighteen questions was developed to gather information from speech-language pathologists who work with these types of residents. The eighteen questions included demographic information as well sampling how the Speech-Language Pathologist implemented music into therapy, if the use of music has a positive affect on memory, mood, and communication with their patients, and the benefits and barriers of implementing music. This study had 71 voluntary responses with 49 of those responses warranting successful completion of the survey and usable responses. 100% of those 49 respondents said that music has shown to have a positive affect on their Alzheimer’s patients. 80.85% of the respondents use music in some form (stimulation, recreational use, speech therapy, etc.) within their facility. 80.18% said their patient’s mood seemed to be affected by music, while 73.81% said their patients’ communication skills seemed to be positively affected or enhanced by music and 47.50% stated that their patients’ memory seemed to be affected by the use of music. The majority of surveyed Speech-Language Pathologists agreed that music is beneficial when working with patients who have Alzheimer’s disease. Typically music is used daily or at least two to three times a week in their facilities. In Speech Therapy treatment sessions, music was generally used to elicit speech and language, to stimulate memory for recalling songs or memories, and for calming or relaxation. Overall, the belief is that music has a positive affect on memory, mood, and communication with those who have Alzheimer’s disease.

STUDY OF BIOCOMPATIBILITY AND BIOMECHANICAL PROPERTIES OF COMPOSITE SCAFFOLDS FOR BONE REPAIR

Abstract: Bone repair is interrupted or stalled in nonunion fractures or bone void formation due to removal of bone tumor. The use of bone cements to anchor the free spaces between the bones to restore bone volume and promote bone healing has been a successful treatment modality. However these modalities do not work efficiently as the void fillers. These materials are usually brittle and cannot be reshaped for proper fit. The long-term objective of the study is to develop appropriate composite materials help resolve the biocompatibility and biomechanical problems mentioned above. The current project focuses on understanding the biocompatibility and biomechanical properties of some composites retrieved from a mice model. / The study involves the use of composite materials developed by a private collaborator (whose chemistry is protected). The biomechanical properties of the above mentioned composite polymer were analyzed through both in-vitro and in-vivo studies. The in-vivo studies involved the use of mice femur void model to understand the osteoconductivity of the scaffold by analyzing the variations of bone volume, bone density and total volume in the femur (thigh bone) of mice. / Twenty mice were chosen and divided into four groups of five mice. The first three groups were assigned a
biomaterial and the last group was used as a control. The bio-composite scaffold was surgically inserted into the mid-shaft of mouse femur and the mice survived for six weeks before sacrifice. After the set period, the limb with implanted scaffold was harvested and microCT scan was performed to analyze the bone volume fractions and mineral densities within the scaffolds. The preliminary results suggest redevelopment and osteoconductivity in the composite scaffolds. After microCT, 3-point bending biomechanical test on the implanted limbs was performed using a Bose® electroforce testing apparatus. The final assessments of data will be accomplished in the near future.

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Natural Sciences and Engineering Poster Presentation

DESIGN AND MANUFACTURE OF END-CAPS FOR A CHEMICAL VAPOR DEPOSITION SYSTEM TO GROW CARBON NANOTUBES

Abstract: To synthesize Carbon Nanotubes in a chemical vapor deposition reactor, a perfectly sealed environment is necessary for high-temperature decomposition of a carbon source in the vapor phase. The current furnace utilizes a large quartz tube for which custom end-caps are required. To allow for operation of the furnace, these end-caps must be fabricated. They have been designed to fit the necessary parameters, including size, temperature, and sealing quality. 304 stainless steel is the material of choice, as it exhibits good strength, corrosion resistance, and is suited for high temperature operations. For optimal performance, the end-caps have been designed to provide a vacuum-tight seal with chemically resistant, silicone O-rings. In addition, due to its unique V-Band coupler design, the entire assembly is easily installable for frequent assembly and disassembly. For manufacturing, stock size and material waste has been considered to minimize weight, reduce cost and expedite machining. The part features have been optimized to provide a compromise of feasibility and functionality. With the completion of the end-caps, the chemical vapor deposition system will be functional and able to synthesize nanotubes. This will enhance research capability in the College of Engineering, allowing the application of the exceptional properties of carbon nanotubes in various systems. Additionally, the custom end-caps provide a final product that is superior in quality and functionality to current choices on the market. With its unique, effective, and scalable design, the assembly will effectively function in the current setup, and could be modified and adopted in other high-temperature materials processing systems.

Maddison Downs
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HELPING PROFESSIONS: STUDENT CHARACTERISTICS LEADING TO CHOICE OF MAJOR

Abstract: This descriptive research will focus on birth order and the effects on a student’s choice of altruistic majors in psychology, sociology or social work. The study will also investigate the relationship of gender, age gap between siblings, and the perception of major on the student’s choice of discipline. The research maintains that having siblings and age gap between siblings play a role in understanding major choice. Further, the research will explore how gaps in age may affect the dynamics of siblings, which could influence the traditional characteristics of one’s birth position and ultimately the choice of one’s major. / The methodology for the current study used an online survey developed through
Qualtrics© and is distributed through SONA© and Blackboard©. A non-probability sample was drawn from students enrolled in classes in the departments of Psychology, Social Work, and Sociology. The survey included questions about siblings and their beliefs and opinions about the professions of Psychology, Social Work, and Sociology. Bivariate and multivariate statistics are used to measure the relationships between age, gender, and birth order on major choice. Preliminary findings suggest that individuals with siblings expressed higher levels of altruism. However, if individuals had older siblings their levels of altruism was lower than those with no older siblings. Preliminary findings found that students thought of Social Work as the least prestigious major while Sociology was viewed with more prestige. Conclusions from this research indicate there is a connection between having siblings and choice of major. First, by having sibling’s student’s levels of altruism are higher, however those with older siblings showed lower levels of altruism. Further students perceptions of majors indicated Sociology to be the most prestigious. The implications of the study are that a student’s level of altruism is connected to having siblings and ultimately choice of college major.

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ELECTROMAGNETIC RESONANT BONE HEALTH SENSOR PATCH FOR DETECTION OF OSTEOPOROSIS

Abstract: Osteoporosis is a primary health concern in the aging population, affecting approximately 40 million men and women over the age of 50 in the United States each year. Currently the most viable way to detect bone loss is through dual energy X-Ray absorptiometry (better known as a DEXA scan) which requires large equipment to produce images. This study is focused on developing and characterizing a smart skin electromagnetic resonant sensor to aide in the early detection of osteopenia. This bio-monitoring sensor uses a combination of radio waves (RF) waves and magnetic/electric fields to measure physiological parameters in a unique and innovative way. The sensor is unique because it does not have electrical components, electrical connections, or batteries. It is made up of a single baseline component which is a trace of conductive material configured into a planar spiral micro-coil patch. When an incident RF wave impinges upon the spiral micro-coil an inductive electrical current flows within the spiral trace resulting in magnetic and electric fields formulating around the sensor. The objective of this study was to characterize the ability of the sensor to detect changes in bone density by measuring fluctuations in the magnetic/electric fields of the sensor. Osteoblast cells were cultured in flasks until the cells were confluent. Using a Vector Network Analyzer (VNA), shifts in the resonant frequency response of the sensor were recorded and will be analyzed to determine if there is a correlation between cell density and frequency shift.

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QUANTIFICATION OF ARTERIAL ELECTROMAGNETIC PROPERTIES FOR PERIPHERAL ARTERY DISEASE SCREENING
Abstract: Peripheral artery disease (PAD) is a slowly progressive vascular disease characterized by abnormal narrowing of peripheral arteries through atherosclerosis. PAD often goes unnoticed and is heavily underdiagnosed due to its initially asymptomatic features and if not detected early enough can lead to critical limb ischemia or limb amputation. Current PAD screening options are limited to the clinical setting and require specialized equipment, specialized training in operation, specialized training for interpretation of the results, and lack the ability to screen for PAD in a simple, cost effective point-of-care manner. In this study, our objective was to create a novel, non-invasive, point-of-care screening patch for the early detection of PAD. To attain our objective, we tested our hypothesis that electromagnetic changes in the permittivity and permeability of blood can be used to detect blood-flow abnormalities of PAD with a simple wireless biosensor – applied like a small adhesive bandage. When activated by an external RF wave, the skin patch developed an electromagnetic field that penetrates into its surroundings. Using a Vector Network Analyzer (VNA), we were able to quantify the skin patch’s electromagnetic field interactions with its surroundings. Using a human arm phantom with vascular network, synthetic blood, and heart pump the skin patch was able to measure pulsatile blood flow as shifts in the sensor’s resonant frequency. The results were validated using an ultrasound pulse wave Doppler which detected 50 bpm on the arm phantom. The smart skin patch was able to detect pulsatile flow with 100% accuracy when compared to ultrasound. These results strongly suggest that the patch may be capable of measuring pulsating blood-flow in a point-of-care fashion which does not require specialized training or expensive equipment. What’s more, is that this biosensor does not have batteries, no electrical components, and has wireless communication.