Book of Abstracts

The CUNY Research Scholars Program

Spring 2017

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1. Effect of Oxidative Stress on THD14 mRNa Expression
   Emmanuel Adebola
   Prof. Ralph Alcendor

   Tetrahymena thermophila are free-living ciliate protozoa that can be found in fresh water around the world. These organs are model organisms for biomedical and toxicology studies. Studying these cells has led to important findings such as mechanisms controlling cell cycle, identification of cytoskeleton and discovery of the structure of telomeres and telomerase. These cells are known to be very resistant to temperature and other environmental conditions. Therefore, they are ideal for examining the effect of oxidative stress, OS. Oxidative stress is the imbalance between levels of free radicals and the ability of the body to neutralize these free radicals. High levels of OS can prevent proteins, DNA and other important molecules from functioning. To combat these free radical's organisms, have antioxidants that can neutralize or eliminate these free radicals. Sirtuins are a family of proteins found in almost all living organisms. The name sirtuins comes from yeast silent mating type information regulation 2 or sir2 family of proteins. These genes and proteins have been implicated in in a wide variety of cellular functions such as control of circadian clocks, mitochondrial biogenesis, cell death and survival, and longevity. Cells with mutated form or overexpressing sirtuins live longer than normal cells. Mammalian cells have several sirtuins. In other organisms these enzymes have been shown to function in regulation of OS. In Tetrahymena thermophila, the role of sirtuins in regulation of OS has not really been examined.This project aims to examine the effect of OS on TH14, one of several Tetrahymena thermophila sirtuins. Cells were exposed different concentrations OS inducers: glucose, iron, NaCl, H2O2, copper and ethanol for 24 - 48 hrs. followed by cell death and mRNA analysis. High concentrations of these OS inducers lead to significant cell death. 500 mM of iron, NaCl, copper and ethanol resulted in 23%, 33%, 34%, and 29% cell death after 24 hrs. H2O2 at 500 µM only caused a 9% reduction in cell survival compared to 49% by 1.0 mM . Glucose at 3% and above induced more than 30% cell death after 24 hrs. So far, THD14 gene expression increased in the presence of increasing concentrations of most of the conditions listed above, with NaCl showing greatest amount of increase, more than 150% increase. On the other hand both 0% glucose and starvation resulted in lower levels of THD14 gene expression compared to control. These results indicate THD14 may be involved in OS regulation, although the type of involvement may be dependent on the OS inducer.

2. Build a Wireless Sensor Network with XBee
   Rachel Alexander, Amelia Ramnauth
   Prof. Xin-Zhou Wei

   Recently, privacy and information have been impacted widely. Hackers have been intercepting vital information which is a growing problem that needs extra attention. XBee modules and ZigBee are very important devices to become acquainted with when learning the basic fundamentals of engineering. XBee and Arduino work hand in hand when it comes to creating wireless sensor systems. XBee is a wireless communication module that can be used to create wireless networks in any configuration. The objective of this research is to create a dedicated Wi-Fi network and transmit information over long distances rather than paying for extra internet service or 4G LTE service from another company. We will create a cryptography protection system to protect our data being transmitted through the network. XBee modules are radio devices that use ZigBee or 802.15.4 protocol. It sends and receives data by the 2.4GHz at a relatively low power and can be used to set up simple point to point links. ZigBee is an IEEE 802.15.14 communication protocol used to create personal area networks with small low powered digital radios. ZigBee is simpler and less expensive than other wireless personal area networks such as Wi-Fi and Bluetooth. Its power transmits from 10-100 meters line of sight depending on power output and environment characteristics. It also provides a 128 bit encryption for data security. We have already configured the XBee modules on a PC and tested its capabilities. We also have conducted minor tests that ensure connection between two XBee modules. We are currently in the practice of programming our security for our network.

3. Waste-To-Energy Combustion Chamber Simulation
   Mohammed R. Alif
   Prof. Masato Nakamura

   We studied the simulation of a combustion chamber in a Waste-to-Energy (WTE) Power Plant. The interaction of thermal treatment on Municipal Solid Wastes (MSW) is a process that involves water evaporation, gasification, and char oxidation. This process is all to reduce the amount of waste that consumes the Earth's surface, as well as to maintain a healthy environment. The MSW combustion chamber model was used to investigate the behavior of different materials, called tracers, each with contrasting shapes and densities. By observingthe behavior of the model when in contact with the tracers, the motion of the model could be affected. The possible experiments to observe simulation of a combustion chamber in a WTE Power Plant is discussed.

4. Significance of Entrance Door Infiltration to Building Environment
   Lev Chesnov, Javonne Senior
   Prof. Daeho Kang

   The purpose of this research is to explore energy implications through building entrance doors. It signifies how energy is being loss through building entrance doors. The unwanted infiltration of air through doorways contributes to building energy consumption. This physical phenomenon depends upon many factors. These factors may include types of doors, frequency of door use, outdoor climate, and indoor environment. Through the existing studies, we gained knowledge of the use of measuring instruments and how to monitor the variation of indoor thermal environment.
   We conducted our own measurements on the environmental factors over the double swinging entrance doors and the adjacent lobby area in the Environmental Building and the Voorhees Building. We analyzed the data collected to see the variation of the indoor thermal environment. We present the results of the measurement on a spring day in the Voorhees Building. We learned that the indoor thermal environment significantly varies with the infiltration.

5. Interactive Robotic Mannequin
   Aryuna Dashidorzhina
   Prof. Farrukh Zia

   In the first phase of this project last semester, a prototype life size robotic mannequins was designed and built for the fashion and clothing industry. The goals were to minimize power requirements and material; and at the same time maximize the functional purposes, such as interaction with humans. In the second phase of the project, state of the art Alexa voice recognition and online search software is used with Raspberry Pi embedded computer to implement voice control of the mannequin's head and arm movements. The mannequin's design and development utilizes many different software tools for physical, electrical, computer hardware, software and network communication subsystems. Therefore, it can also be used for demonstrating and teaching these topics in several computer engineering technology program courses.

6. Design of a Cell Phone Charging Exercise Bike with Magnets
   Ustad Dasrao, Christo Sam
   Prof. Angran Xiao

   In this project, the professor and students in Department of Mechanical Engineering Technology will design and build an excise bike that is able to power a set of cell phone chargers. The chargers will be powered by both a solar panel and the pedaling movements. The project will

showcase the design and manufacturing capabilities of the college, as well as promote environmental consciousness among faculty and students.

7. A Study of Cultural Competence and Implicit Bias Amongst Healthcare Students
   Natalia Dembowska, Jerry Strklja
   Prof. Zoya Vinokur & Prof. Elaine Leinung

   Cultural competence is defined as the ability of providers and organizations to effectively deliver equitable and unbiased health care that meet the social, cultural, and linguistic needs of a culturally diverse patient body. By 2050, minority populations will increase to 48 percent of the U.S. population and Hispanics will represent 24.4 percent of the total population (U.S. Census, 2010). This demographic shift brings challenges and opportunities to universities and organizations alike to create policies and curriculums that foster quality health care amongst students, while also contributing to the eradication of implicit biases that may unwittingly perpetuate healthcare disparities amongst racial and ethnic minority groups. Our research looks to answer the critical question of whether or not health care students are adequately prepared by their universities to deliver healthcare services that are culturally competent and sensitive? Are students aware of the importance of implicit biases and what measures can be taken on an institutional level to ensure that healthcare students are adequately prepared to deliver equitable healthcare to all minority groups. This study looks to gauge the understanding of cultural competence amongst a group of City Tech healthcare students by utilizing a cross-cultural survey of cultural competence questions dealing with poverty, age, stereotypes, illiteracy, homophobia, language, religion, and racism. Our data and research results suggest that many health care students are not able to properly define, nor fully implement cultural competence and sensitivity in their clinical settings. This data is significant because administrators and educators need to incorporate more learning strategies and relevant clinical training so that students may enter the work force better equipped to deliver the highest quality of care to all patients, regardless of race, ethnicity, cultural background, English proficiency or literacy.

8. MoDAR: A Mobility Detection and Auto-Recognizing Robot
   Fatime Zahra El Fatimi and Felicia Jeter
   Prof. Andy S. Zhang

   MoDAR is Mobility Detection and Auto Recognition biomedical smart device that will be used to help physically and visually impaired people to be relatively independent by allowing them to have a more informed , confident, and efficient way of living.The device will be a fully automated stand alone with system add on ability that is capable of detecting and recognizing surrounding environment ,global positioning system and area mapping and delivering feedback to the user based on several different input commands mainly from voice command and couple

of control switches. In addition, the device will be able to have safety features to warn the user of any hazardous situation.

9. Design of an Alternative 9-1-1 Mobile Communication System Concept
   WeiJie Gao, Wen Yong Huang, Brian Taveras
   Prof. Daniel Wong

   The 9-1-1 emergency system is an essential service to our society and plays a critical role in the process of resolving emergency situations. The system could improve its efficiency by upgrading the platform it works on using a system that takes advantage of the latest technologies. Improvements to the current 9-1-1 system could save more lives if efficiencies can be made. This project will define the existing 911 communication system inefficiencies and create a mobile app solution. It will offer new functions such as determining location passively using GPS, optimizing it for foreign language situations, make it convenient for people with disabilities, potentially increasing the response time. The current 9-1-1 system does not fully incorporate the technologies many people use in their everyday life. Many people interact with their smartphones on a regular basis during the day. Communication can occur across the globe within seconds, which can allow for warning systems to activate in an event of a local and regional emergency. Our preliminary research investigates the existing 9-1-1 system. We will interview and collect information from users throughout the system pipeline to see how the current system functions, and ask for recommendations from users—first responders, call centers, people in emergencies, government agencies—to determine where efficiencies can be improved immediately. From that research, we will investigate existing technologies not currently being applied to the system. We will also extrapolate and suggest ways in which future systems might be incorporated to improve the response times. Our research goal would result in the proposal of an alternative or additional system for aiding in emergency situations. Adoption of these concepts would potentially save lives, avoid personal and physical damage/destruction, and minimize risks to those whose job it is to aid those in need.

10. Designing Bowling Ball with Concrete
    Bryan Hoy
    Prof. Navid Allahverdi

    The objective of this research is to design and build a bowling ball using fiber reinforced concrete. After the successful design and build of bowling ball it is possible to participate in the American concrete institute bowling competition. The winning ball is going to be judged based on the following categories the mass test, Bowling test, diameter consistency test, Final deformation load test, and Toughness load Test. The mass test is when you weigh the ball to see

if it reaches the require mass. For the diameter test if the diameter is more than 15 mm and less than the standard of 200mm the ball will be disqualified. The bowling test is a when you roll the bowling ball down a v shaped ramp to knock pins over and earn points. The final deformation test requires you to predict a load the ball can take. The Toughness load test while the final deformation test is being performed for every 5mm you records the 5 loads and average them. Different balls with varying portion of fiber will be designed and cast. Consequently these balls will be evaluated based on the competition criteria to arrive at the best design.

11. Drug Delivery Tests for PDMS-based Scaffolds
    Maria Medina, Navid T. Samani
    Prof. Ozlem Yasar

    Drug delivery plays an important role in cell growth during the process of tissue regeneration. Engineered scaffolds are used as carriers for this process and help achieve the goal for drug delivery. In this project, PDMS based scaffolds were designed and fabricated by micro-printing at SET Research Laboratory at the department of Mechanical Engineering Technology. Then, the 3D, biodegradable engineered scaffolds with different internal architecture designs were sandwiched between two glass slides to do drug delivery tests. Our results show that PDMS can easily be used for scaffold fabrication and that by using a certain design drugs can successfully be transported through the scaffold.

12. Race Springs
    Timothy Medina
    Prof. Gerarda Shields & Prof. Derek Wilson

    Current approach to water treatment by modern technology has led to inducing our water with chemicals. Rather than understanding our environment, and mimicking ecosystem's filtration process. Our modern technology has produced a costly process that not every civilian may have access to. Making water more of a currency income rather than a natural resource.
    By the study of water and contaminated inhabitants. A natural chemical alternative can be introduced, worldwide. Using surrounding resource's chemical abilities to combat contaminated water in habited areas allowing better living, cost effective attribution with resources both recycled and non-recycled, and gaining understanding of our existing environmental provision in our immediate area codes that are to be beneficial for survival.

13. Cognitive Skills and Strategies for Anatomy and Physiology Infograms
    Rachel Ofer
    Prof. Vasliy Kolchenko

    Our research addresses the need for better understanding of cognitive processes in STEM learning. We optimize graphic abstraction in the innovative learning materials called Infograms that were developed at New York City College of Technology by Professor Kolchenko for Anatomy and Physiology course, and assess the effectiveness of the materials in the classroom. Infograms use graphic symbols, key words and abbreviations to generate meaningful narrative that has the potential to enhance learning. The Infogram is designed to promote and develop abstract, creative, and critical thinking rather than rote memorization by encouraging students to use their imagination while recalling and visualizing the material. Our previous studies show that recalling is a more efficient way of learning than rereading. Here, we explore various types of essential cognitive skills and strategies emphasizing the difference between deep and superficial cognition, and analyze students' opinions and beliefs about them. We anticipate that this research may have a positive impact on educators who wish to improve cognitive skills of their students, and on students who are motivated to achieve better learning outcomes.

14. Differentiation and Neurotoxicity of PC12 Neuroblastoma
    Tiffany Ramkisun
    Prof. Jeremy Seto

    PC12 neuroblastoma cells arise from adrenal medulla cancers in rat. The neuroectodermal lineage of these cells provide an easy model to dissect the processes underlying neurodevelopment through cytokine application. PC12 cells undergoing differentiation reveal markers of neural phenotypes. Through the perturbations in the differentiation protocol and identifying cellular markers in vitro, transcriptional activation of specific genes in migration and axon guidance can be studied as a model of changes found in neuropsychiatric diseases. As a neuronal-like cell line, they can be used in studying pharmacological mediation of neurodegenerative insults such as metal toxicity and plaque forming beta-amyloid.

15. Application of High Performance Concrete in Structural Design
    Brandow Rojas
    Prof. Navid Allahverdi

    High performance concrete (HPC) exceeds in durability and strength compared to regular concrete. The materials that make up HPC must be engineered to achieve certain specifications of durability for the requirements of the project. HPC is used in the construction of tunnels, bridges and tall buildings. One of the many examples is the One World Trade Center. The type of concrete used for the construction of the One WTC is called ICrete. The compressive strength of

such concrete exceeds the 12,000 psi mark. In this research activity, application of HPC in structural design is investigated. Also, high performance concrete samples is designed and tested in the materials lab in the CMCE department.

16. Scaffold Fabrication for Cell Viability Analysis
    William Santiago
    Prof. Ozlem Yasar

    One of the principle challenges in Tissue Engineering, especially with the production of large tissue constructs, is the cell survivability within the scaffolds. Cells can show healthy growth within the scaffolds if biocompatible materials are used to generate the scaffolds.
    In this project, collaborative work is done between the SET Research Laboratory at the department of Mechanical Engineering Technology at City Tech and Mechanical Engineering department at California State University, Chico to fabricate the scaffolds and to do the cell viability tests. Our preliminary results show that cells can survive within the PEGDA based scaffolds if 20% of PEGDA is used to fabricate scaffolds.

17. Selection of Materials and Techniques for Construction Under Extreme Heat Conditions
    Harold K. Saquicela
    Prof. Anne Marie Sowder

    The construction industry is one of the biggest industries in the world representing 13% of the total global GDP. Research suggests that the construction industry is already affected by climate change, specifically extreme heat conditions which include high temperatures and prolonged periods of high temperatures. According to The National Cooperative Highway Research Program, about 50% of all construction activities are affected by weather to some degree, and the National Oceanic and Atmospheric Administration states that extreme heat conditions make up a growing share of weather and climate change related disruptions. Heat is very dangerous and costly. Heat can damage materials and equipment on sites, affect the health conditions of workers, and reduce labor productivity. This ultimately causes delays and additional costs to construction that run into the billions of dollars annually.

    With extreme heat conditions expected to occur more frequently in 2016 and beyond, there is an urgent need to improve the planning of materials and techniques used in the construction industry. Unfortunately, there is a lack of research that connects construction practices to climate. For this reason, the objective of this research is to explore materials and techniques that will minimize the direct and indirect impacts of extreme heat conditions on construction. Thereby, allowing construction activities to progress during hot weather conditions and in an increasingly hot climate with minimal effects to health, safety, schedule and budget.

18. Gender Differences in Vagal Tone Adaptation in an Expressive Writing Paradigm
    Christina Taitt
    Prof. Jean Hillstrom

    Research shows that writing about traumatic, stressful or emotional events is associated with improved health and well-being. We assessed the effects of a standard vs. meaning-making expressive writing format on autonomic nervous system function over time. Heart rate, and to a lesser degree, vagal tone, improved over time in both conditions but vagal tone and respiration changes were moderated by gender.

19. Implementation of Cyber Physical Systems
    Mellissa Valle
    Prof. Farrukh Zia

    A Cyber Physical System combines sensors and actuators with embedded micro-controller to monitor and control the physical environment, remotely through the Internet. This particular implementation of a Cyber Physical System uses Intel Edison embedded micro-controller, a sensor shield, and a set of environment sensors to monitor the growth of a plant. Soil moisture as well as plant's temperature, humidity, ultra-violet light intensity and visible light intensity levels are measured and transmitted over a Wi-Fi network to a web site. Sensor data is stored and analyzed on the web site, where it can be viewed in a web browser across the Internet. In a future phase of this project, plant growth will be monitored and controlled by carefully measured application of light, heat and moisture.
