Abstracts of the Emerging Scholars Program Research Projects

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Title: Design Methodology
Student Researchers: Loyra Nuñez, Faraz Siddiqui
Faculty Mentor: Prof. Lia Dikigoropoulou
Department: Architectural Technology

Architectural Design is a complex process. There are different approaches to the design process. Under this example we are going to try and show how a film or a movie becomes the driver for inspiration, in a design studio. We will document the design process in a studio, and how it explored the art of film and film making, and how it eventually transformed into an architectural space.

Title: Professional Architectural Design Portfolio Book for All Design Studios
Student Researcher: Margarita Salas
Faculty Mentor: Prof. William Valdez
Department: Architectural Technology

Throughout all of the design courses, there will be a combination of all the physical and analogue models, digital rendered projects, and representation of geospatial information to create and unify a professional portfolio. It will provide the fundamental tools and an understanding on how to represent, illustrate, and present design work to other professionals in the architectural field.

The portfolio will consist of three main parts: the collection and organization of the work, editing and setting up of layouts, and the printing of the finished professional portfolio booklet. This process will lead us to the goal of the project, which is to strengthen and prepare the student's visual, verbal, and graphical skills so the student may demonstrate her fluency and understanding of the key design vocabulary, concepts, and visual techniques as a tool for the professional environment.

Discussion of page layouts and different types of outputs will be established for the finished projects. The furnishing of graphic communications and the visual information of the architectural work will be done throughout the project with the addiction of physical models. With the completion of the portfolio and presentation board, I (as the student) should have the ability to distinguish: the different types of drawing techniques, demonstration of knowledge of graphic methods, the ability to communicate information though oral presentations, reorganization of architectural design concepts, language, context, and professional environment.

Title: Stepping Stones - A Look at Circulation in Downtown Brooklyn
Student Researchers: Raymond Jimenez, Genaro Cobar, Catherine Brito, Andrea Garrido, Enny Filpo
Faculty Mentor: Prof. Paul King
Department: Architectural Technology

The goal of this project is to examine circulation routes in downtown Brooklyn and look to improve these routes by developing new improving existing "stepping stones" or "urban spaces" to facilitate better circulation and connectivity to the Brooklyn Waterfront.

Stepping stones in a literal sense provide a clear path between two points often across a barrier or material that would otherwise be difficult to traverse. For a stepping stone path to function well the stones must be close enough so one can step from stone to stone. If spaced too far apart the path is discontinuous and fails to function.

Urban Open Spaces can act like stepping stones to provide a continuous route of circulation between two points. For the stepping stone path to function in this model the Urban Open Spaces must be close enough to each other to be visible from one to the next.

Title: Solar Decathlon 2015 DURA Module Design Resiliency and Stacking
Student Researchers: Hadiza Djibring, Chantal Manning, Geury Delacruz
Faculty Mentors: Profs. Alexander Aptekar and Paul King
Department: Architectural Technology

The Solar Decathlon Team at New York City College of Technology will strive to develop a positive-energy house that is Diverse, Urban, Resilient, and Adaptable [DURA]. Our project must serve a diverse populace because our college is centered in one of the most diverse neighborhoods in downtown Brooklyn. It must be urban both because we want to respond to our city's environment and because we want to differentiate ourselves from previous solar decathlon solutions. It must be resilient to respond to the changing climate and needs of New York City. It needs to be adaptable to be as versatile as possible to meet our design goals. This team research project will develop the required systems and assemblies to construct and complete this prototype project. Our research focuses on module design construction strategies, how the modules will stack together, and in what ways this arrangement can support units that are resilient to natural disasters.

Title: Solar Decathlon 2015 DURA Vertical Solar Wall (Electric and Thermal Energy)
Student Researchers: MuJuN Chen, Stephen December, Adam Elkhouly, Victor Green
Faculty Mentors: Profs. Alexander Aptekar and Paul King
Department: Architectural Technology

The Solar Decathlon Team at New York City College of Technology entry will strive to develop a positive-energy house that is Diverse, Urban, Resilient, and Adaptable [DURA]. The team is designing the vertical solar facade with an urban solution in mind. Our technology has evolved rapidly over the past decade, with this tool of technology in hand. It allowed us to think and understand more about our relation to the sun. Solar energy is considered one of the clean energy solutions for the future. Traditional solutions place solar panels on top of the structure's roof to collect solar energy, but is this being efficient? This strategy works for certain climate zone, typically 20 degrees S to 20 degrees N latitude. Unfortunately, New York at 40 degrees North is not in that climate zone. This will impact the position and angle variables of the solar panels. Our South façade will contain vertical fixed and operable solar panels (ongoing research) to capture solar energy all season long thru design and engineering effort. The solar panels will also act as a shading element, minimizing heat radiation into the building and allowing the interior to stay cool and maintain a suitable temperature. Our South facade design is also integrated into traditional mechanical system to take advantage of the thermal exchange with the house. This design shift is critical for urban environments, since typical buildings have more vertical exposure than rooftop exposure, which results in collecting more solar energy and

freeing up rooftop space for gardens and other potential uses. This is also a financially attractive solution.

Title: Solar Decathlon 2015 DURA Parametric Design Reflecting Wall
Student Researchers: Daniel Otto, Agata Whyte, Catherine Brito
Faculty Mentor: Prof. Alexander Aptekar
Department: Architectural Technology

Advances in technology, particularly concerning architectural design, have given designers the ability to analyze the way architectural elements make buildings perform well before any material construction or prototyping takes place. Using some of the most advanced digital design mediums, we can visualize live changes and the way architectural elements perform as we make changes and studies in our 3D digital models. In this study, we will be using a combination of digital mediums such as RHINO, Grasshopper, and DIVA, to parametrically design an architectural exterior façade that works to reflect sunlight back into the DURA house interior. Since the 3D façade design will be constructed using a series of live updating parameters, we can quickly and efficiently derive countless designs and choose a design that gives us the optimum interior day lighting performance. Upon successful completion of the façade design, we can thus go into the fabrication phase of the design for installation of the DURA house for the 2015 Solar Decathlon Competition.

Title: Solar Decathlon 2015 DURA Super Exterior Cladding Systems
Student Researchers: Agata Whyte, Osmany Cabrera
Faculty Mentor: Prof. Alexander Aptekar
Department: Architectural Technology

The Solar Decathlon Team at New York City College of Technology entry will strive to develop a positive-energy house that is Diverse, Urban, Resilient, and Adaptable [DURA]. For its development, we are researching and developing different cladding options. All of these options are researching methods to improve the highest quality existing wall assemblies. The assemblies under investigation for use in this project include:

- Insulated dense cell foam frame construction
- Hemp insulated structural panels
- EIFS (Exterior Insulation Finishing System)

Title: Solar Decathlon 2015 DURA Interior Wall For Evaporation Cooling
Student Researchers: Farhana Rahman, MuJuN Chen, Stephen December, Victor Nkama, Yuliya Zavolunova
Faculty Mentor: Prof. Alexander Aptekar
Department: Architectural Technology

In this research project, we examine evaporation cooling application applications to our interior walls. These wall systems will be designed to disperse moisture for evaporation cooling. By introduction of evaporative cooling walls we hope to reduce the energy cooling load on our project. A Thermal wall (thermal mass) is being studied as a component of the cooling system.

An efficiently constructed thermal wall can play a major role in the reduction of energy used in conventional active heating and cooling systems. They are at high density by linear foot and have a high specific heat storing capacity. This integrated alternative climate control system is what we are studying.

Title: Information Theory: The Key to Unlocking the Secrets of the Proteome
Student Researcher: Brittiny Dhital
Faculty Mentor: Prof. Armando Solis
Department: Biological Sciences

Proteins are one of the most important macromolecules in the human body. Consisting of long polymers of amino acids, proteins perform many functions vital to life, from molecular carriers to reaction catalysts to immune system components. It is because they are so vital to our existence that scientist have endeavored to determine the unique three dimensional shape that each protein adopts as these structures dictate its specific function. In the past, the method for unlocking the mystery of protein folding was x-ray crystallography, an arduous process whose outcomes were dependent upon the precision of the technique and the relative purity of the sample.

In this modern age of technology, scientists are merging biochemistry and computer informatics to advance current knowledge. Data mining, multiple sequence alignment software, and proteomic databases are now standard tools used to analyze proteins. A revolutionary concept to previous methods was the application of Information Theory to the quandary of protein folding. This approach merges probability states of possible conformations with energy and equates it to the gain in knowledge generated by the narrowing of possible conformations that could be adopted. The resultant values generated by the subsequent information gain are demonstrated to be more optimal than standardized Z-scores, a probabilistic method used in determining threading success. The purpose of this research is to perform a synopsis of current work relating to this field and discuss future applications of Information Theory to the enigma of protein folding.

Title: Cloning a GPCR from the Least Shrew
Student Researcher: James-David L. Brown
Faculty Mentor: Prof. Jeremy Seto
Department: Biological Sciences

The Serotonin 2A Receptor (5HT2A) is a member of G-Protein Coupled Receptors (GPCRs) involved in neuropsychiatric disease and psychosis. Atypical antipsychotic medication have direct effects on this receptor as do psychogenic drugs such as Lysergic Acid Diethylamide (LSD). In the presence of direct hallucinogenic stimulators, like LSD, animals display sensory hallucinations. Rodent models of sensory hallucinations is often measured through a head-twitch, as if the whiskers have been stimulated. This behavioral paradigm is mimicked in other animals. However, 5HT2A hallucinogenic compounds do not elicit a head-twitch response in the model organism, the least shrew (Cryptotis parva). Using a shrew brain library, we would PCR subclone the 5HT2A receptor for sequencing purposes and for heterologous expression systems that will elucidate the alterations to the amino acid sequence that would illuminate the biochemical signaling of this receptor.

Title: Infograms: Graphic Symbolic Summaries and Optimal Levels of Abstraction for Anatomy and Physiology
Student Researchers: Andrew Maloney, Kelly Smith
Faculty Mentor: Prof. Vasiliy Kolchenko
Department: Biological Sciences

The successful study of anatomy and physiology requires the comprehension and retention of a large volume of information. Imagery has been used to facilitate and accelerate the acquisition of knowledge for thousands of years. Unique learning materials called *Infograms*, or graphic symbolic summaries, have been developed at City Tech for BIO 2311, Anatomy and Physiology I. *Infograms* employ key terminology, abbreviations, pictograms, simple charts, diagrams and line drawings to encode and condense information on one page. Each*Infogarm* is supplemented by a brief text explanation and detailed slides. Our research compared and contrasted *Infogram* approach with other educational techniques used to formalize and structure scientific knowledge (videos, concept maps) in order to better understand the cognitive mechanisms of this new learning method, its relative efficiency, and avenues for improvements. Our analysis supports the use of*Infograms* and related videos as efficient tools for improving comprehension and retention of knowledge. The results of the learning style survey demonstrated that the majority of the students are visual learners. Additional research is needed to determine the optimal level of the *Infogram* abstraction and to utilize the video format for presenting the material.

Title: The Effect of a High Fat Diet in Female Reproduction
Student Researcher: Faizan Khalid Malik
Faculty Mentor: Prof. Sanjoy Chakraborty
Department: Biological Sciences

The occurrence of obesity is on the rise and high fat diet plays an important role. Obesity has a far-ranging negative effect on health including high blood cholesterol, dyslipidemia, insulin resistance, glucose intolerance, cardiovascular disease, some type of cancers and poor female reproductive health, non-alcoholic fatty liver disease (NAFLD), diabetes and many other diseases. In this project we will study the effect of a high-fat diet (HFD) in homeostasis with special emphasis to female reproductive axis. Recent research showed that obesity causes insulin resistance, earlier puberty, menarche in girls and infertility. This study will aim to find the caloric intake in animals fed with very high fat diet (VFHD) and its correlation with reproduction. Recent reports showed that the caloric intake for animals on VHFD was significantly higher than normal diet (ND) indicating that it is not the amount of food but the caloric intake that was responsible for the differences in the weight increase between the two groups. Further study will be conducted to observe any changes in the fertility status in males and females with HFD.

Title: B Lymphocytes and Multiple Sclerosis
Student Researcher: Thomas Waters
Faculty Mentor: Prof. Andleeb Zameer
Department: Biological Sciences

The objective of this project is to determine the role of B lymphocytes in Multiple Sclerosis (MS), a demyelinating autoimmune disorder of the nervous system. Most studies in MS have examined the role of T lymphocytes in autoimmune destruction of the brain and spinal cord. However, recent studies have shown that B lymphocytes accumulate in lymphoid-like aggregates and that many are infected with Epstein-Barr virus in MS. B lymphocytes also accumulate in the subarachnoid space as well as in myelinated neuron tracts and that they may be the site of a cytotoxic immune response. Rituximab, a drug that suppresses the differentiation of B cells into mature plasma cells, has the ability to reduce MS relapses in a Phase 2 clinical trial. Further studies in rodents have demonstrated that certain B cells can secrete pro-inflammatory cytokines making them effector cells. In conclusion, there is ample evidence to suggest that B cells play a critical role in the pathogenesis of MS. Understanding the role of B-cells in the disease process will help design better therapeutics to cure MS.

Title: How Best to Actively Assess Success of Reading Strategies in Using Peer-Led Team Learning Workshops in BIO1101
Student Researchers: Shannan Massry
Faculty Mentor: Prof. Davida S. Smyth
Department: Biological Sciences

Students at New York City College of Technology, CUNY have been shown to struggle with reading in foundational biology courses. A program titled “Reading Effectively Across the Disciplines” is currently in progress, aimed at teaching reading strategies, assessing reading assignment completion and outcomes of these interventions.

Like most courses, BIO1101 is delivered didactically and reading is assigned. Assessment occurs four times during the semester, usually in the form of multiple-choice exams. No continual assessment is included and in particular the completion of the assigned reading by students is not examined. Considering that the way that students are assessed could have an impact on knowing whether reading strategies and assignments are successful, the research herein aimed to examine the best way to assess the success of the reading strategies and how active assessment could be used in peer led team learning workshops.

This project demonstrates how assessment of the assigned reading is being done by other institutions, what types of assessment can be used, what strategies I’ve used in my workshops as a peer leader in biology and how my findings shall shape the structure of my workshops going forward.

Title: How Can Peer-Led Team Learning Workshops Address Student Learning Styles to Facilitate Independent Student Reading in BIO1101?
Student Researchers: George Cobos
Faculty Mentor: Prof. Davida S. Smyth
Department: Biological Sciences

Students at New York City College of Technology, CUNY have been shown to struggle with reading in foundational biology courses. A program titled "Reading Effectively Across the Disciplines" is currently in progress, aimed at teaching reading strategies, assessing reading assignment completion and outcomes of these interventions. Like most courses, BIO1101 is delivered didactically and reading is assigned. Assessment occurs four times during the semester, usually in the form of multiple-choice exams. No continual assessment is included and in particular the completion of the assigned reading by students is not examined.

Considering that the way that students learn and interact with each other, the text and the instructor could have an impact on knowing whether reading strategies and assignments are successful, the research herein aimed to examine how student learning styles could affect the success of the reading strategies and how this could be addressed in peer led team learning workshops in BiO1101.

This project demonstrates how different learning styles are being addressed in peer led team learning workshops by other institutions, what strategies I've used in my workshops as a peer leader in BIO1101 and how my findings shall shape the structure of my workshops going forward.

Title: Promoting Critical Thinking Through Bloom's Taxonomy in Biology 1101 Peer-Led Workshops
Student Researcher: Ayesha Rasool
Faculty Mentor: Prof. Davida S. Smyth
Department: Biological Sciences

Students at New York City College of Technology, CUNY have been shown to struggle with reading in foundational biology courses. A program titled "Reading Effectively Across the Disciplines" is currently in progress, aimed at teaching reading strategies, assessing reading assignment completion and outcomes of these interventions. These reading strategies can be designed to assess critical thinking. As part of READ, experienced biology students have been recruited to implement workshops and guide student reading as "peer leaders".

'Bloom's Taxonomy of Learning Objectives' was developed by educational psychologist Benjamin Bloom and colleagues in 1956. One of the three domains of the Taxonomy focuses on cognitive skills, to help students know, understand, apply, analyze, synthesize, and evaluate basic concepts.

This research project shall demonstrate how reading strategies can be designed in the context of Bloom's Taxonomy and present selected reading strategies that connect students' understanding and comprehension of the curriculum from the lectures and textbook that were used in workshops.

Title: The Microbiology of the Built Environment: Investigating the Prevalence of Antibiotic Resistant Bacteria in Different Sites at City Tech
Student Researchers: Fabiola Fontaine, Manhin Lam, Wing Pang Kenny Tsang
Faculty Mentor: Prof. Davida S. Smyth
Department: Biological Sciences

Antibiotic resistant bacteria are commonly found in different area, from the human host, to animals and in the environment as well. Among Staphylococci, the coagulase positive *Staphylococcus aureus*, is considered the most pathogenic. MRSA bacteria raise big concerns worldwide because of its high morbidity and mortality rate. Other coagulase negative staphylococci, such as *S. epidermidis* and *S. hemolyticus* presented less danger, even though they have been known to cause infections and are found frequently in the environment.

In the current experiment, we aimed to identify the prevalence of antibiotic resistant Staphylococci in the City Tech environment, using the Namm building as our sampling site, by sampling the button of the elevators from each floor. Chromogenic contact plates were used to collect Staphylococci, particularly MRSA, though other species could grow. Presumptive colonies were patched onto nutrient agar and the DNA of the resulting colonies was extracted, amplified by PCR and sequenced using standard methods.

Blast analysis of the sequences revealed the presence of several bacterial species, including *S. hemolyticus*, *B. licheniformis*, *P. polymyxa*, *S. lugdunensis*, and *S. cohnii*. Most of these bacteria are opportunistic pathogens, which means that they only cause disease in certain circumstances. Being able to grow on the chromogenic plates suggests that they are antibiotic resistant. Surprisingly, identical *tuf* sequences were obtained from the DNA of colonies obtained on different floors. This could suggest there is a potential risk of transmission or the strains of bacteria are endemic in the building. The reason for this result remains to be elucidated.

Our future work will involve the sequencing of additional loci from the bacteria to see if they were all the same strain of bacteria, this shows that sequencing the genome of the bacteria would be warranted and examination of its ability to grow in various conditions mimicking the environment in which it was found.

Title: Synthesis and Characterization of a Resveratrol Analogue as Potential Metal Ionophore and Hydroxyl Radical Production Inhibitor
Student Researcher: Tanzeen Rahman
Faculty Mentor: Prof. Alberto Martínez
Department: Chemistry

The hallmarks of Alzheimer's disease (AD) include aggregation of both intracellular beta amyloid (Aβ) plaques and extracellular neurofibrillary tangles (NFT), composed of hyperphosphorylated tau protein. Metal dyshomeostasis and formation of reactive oxygen species (ROS) are common events contributing to the progression of the disease. All these changes in the brain account for progressive and irreversible dementia that reduces the quality of life for patients and their caregivers. The current standard treatments provide alleviation of symptoms but do not cure the disease.

Mice studies have shown that a natural polyphenolic phytoalexin, known as resveratrol (3,5,4'-trans-trihydroxystilbene), is effective in scavenging dangerous oxygen radicals and destabilizing fibrillar Aβ, ultimately promoting clearance of Aβ from the brain. The goal of this research project was to synthesize a compound that structurally mimics resveratrol, maintains its low toxicity and blood brain barrier (BBB) permeability, and incorporates the additional capability of metal ion chelation. Metal ion homeostasis becomes perturbed in the afflicted brain resulting in metal ion induced Aβ aggregation and the production of hydroxyl radicals leading to oxidative stress and neuronal death.

The target compound, AM16, was synthesized by condensation of aldehyde and amino groups under nitrogen atmosphere using Schlenk techniques. Subsequent characterization by mono- and bidimensional NMR demonstrated the validity of the synthetic route achievement of the proposed compound. In addition, UV-visible results established AM16 high binding affinity for the neocortical metal ions involved in AD pathology over other metabolically relevant metals. On the other hand, fluorescence demonstrated significant levels of hydroxyl radical formation inhibition. Future studies will confirm clinical plausibility, but a theoretical preliminary evaluation of the compound by Lipinski's rules already confirms much inherent potential.

Title: Curcumin: Health Benefits and Nuclear Magnetic Resonance Characterization
Student Researcher: Geoffrey Robinson
Faculty Mentor: Prof. Alberto Martínez
Department: Chemistry

Curcumin is a natural product that can be found as additive in a variety of products; from foods such as mustard, cheese and curry to makeup products. A body of evidence indicates that curcumin is an effective anti-inflammatory and antioxidant, potentially playing an important role in the treatment of diseases like cancer and Alzheimer's Disease. The molecule contains two aromatic rings separated by an aliphatic chain with two ketone functional groups that can establish an equilibrium with the enol tautomer. Nuclear Magnetic Resonance (NMR) spectroscopy was used to characterize the curcumin molecule. Mono-dimensional and bi-dimensional spectra were recorded using a DMSO-d_6 solution and were then cross-referenced to verify the structure and connectivity within the molecule. The characterization of curcumin was successfully achieved, and, although curcumin could exist as a keto-enol tautomer in equilibrium, our results indicated the absence of the keto form, with only the enol form present. This was determined by noting two O-H peaks on the proton NMR, the absence of any CH_2 groups on the ^{13}C DEPT 135 NMR, and an integral values on the proton NMR half the size of what was expected of the keto tautomer.

Title: Using a Computer Science Concepts Ontology for Automatic Item Generation
Student Researcher: Constadinos Lales
Faculty Mentor: Prof. Benito Mendoza
Department: Computer Engineering Technology

Ever since computers and the Internet have come into play with society, schools have seen their potential to enhance education. One area of education where the use of computers has generated several benefits is assessment. In particular, Computer Adaptive Testing (CAT), a form of computer-based test that adapts to the examinee's ability level, has increased

opportunity for timely and detailed formative feedback. However, CAT relies on the existence of a high volume of test items (questions). Automatic Item Generation (AIG) is the practice of automatically producing test items using computer algorithms. It consists on creating templates or models for test items or questions, where some variables and formulas are embedded. These templates are instantiated to create a test item by using algorithms to give values to the variables and formulas—hundreds or even thousands of items can be generated with a single item model. However, this approach works well for questions having numeric variables. For non-numeric questions, one would run into difficulties. The purpose of this research is to explore an alternative method of item generation that grants computers an understanding of natural language using an ontology-an explicit specification of a conceptualization, a formal description of the concepts and relationships. We have develop an ontology for Computer Science concepts that we use as a meta-model or cognitive structure to create richer item templates.

Title: Web Fonts - New Style for Web Sites
Student Researcher: Hibba Abbas
Faculty Mentor: Prof. Marcos Pinto
Department: Computer Systems Technology

We read text all the time and only focus on the content or message of the words themselves rather than what the words look like visually. In reality, fonts convey mood, emotion, and message as well as keying the viewer in to what is important on a page. By using proper formatting, we can actually speed up the time a viewer takes to read the information. Font type can also reflect the overall professional appearance of the website. The most effective way to control font and other typographical styles is through the use of Cascading Style Sheets (CSS) on the websites.

Title: CSS, Responsive Web Design (RWD) and its Impact on Mobile Development
Student Researcher: Felix Gallardo
Faculty Mentor: Prof. Marcos Pinto
Department: Computer Systems Technology

Responsive Web Design (RWD), a relatively new area of technology, encompasses many graphically dynamic aspects of the web pages we use in our day-to-day browsing, both on desktops and mobile platforms. One of the more useful components of RWD are media queries, which allow our devices to analyze and adapt a web page, taking into consideration the native resolution and size of the device's screen. In order to better understand the relationship between stylesheet languages, RWD and media queries, further study is required regarding the correlation between the emergence of RWD, its impact on media queries, as well as the evolution of stylesheet languages that led to RWD.

We have gone from static to dynamic web pages, which change based on the graphical specifications of individual devices. This technology came into prominence largely based off of developments made in Cascading Style Sheets- CSS2 as well as CSS3. CSS2 had some level of responsive web design built-in, which offered a simple level of functionality such as printer-friendly versions of pages. Unfortunately, many of the additions made to CSS2 that added functionality to web-ready devices were implemented imperfectly, often lacking proper zooming

and scrolling functionality. The strides we see today were made using CSS3, which I explain further on in this paper.

Further research has shown that the standardization of the field in regards to CSS and RWD has come in the form of W3C standardized media queries. Ultimately, I found that changes in mobile development came specifically in the form of detection using CSS3. Initially, I believed this change to be able to predict simply the digital resolution, but these standardized queries can use the device's physical specifications to properly modify the web page and more importantly, tailor the stylesheet to the specific use of that webpage.

Title: Chronicling the Achievements and Activities of Honors Scholars at City Tech
Student Researchers: Christian Brito, Leonard Jules, Liza Luboa, Mandy Mei, Khoreece H. Mendoza, Walter Rada
Faculty Mentor: Prof. Reneta D. Lansiquot
Department: English

The first three issues of the Honor Scholars Program newsletter were referred to as a "sporadical" because we did not know how often we would be able to publish. After the first few issues, it now seems that, through teamwork and hard work, we are able to publish twice a year, in the fall and spring semesters. *Scholars* has also been redesigned to ensure that we maintain a unique identity as we move forward. We will continue to include student-written articles that highlight student achievements and experiences, information on program activities as well as a section called "The Professor's Corner," faculty-written articles on current topics of interest to our readers. As we move forward in this redesign, we have focused on the responsibilities crucial to this major interdisciplinary project, including going to scholarly presentations, attending workshops, conducting interviews, creating layouts, editing texts, taking photos, selecting pull quotes, meeting deadlines, and integrating feedback. We take advantage of cloud applications such as Dropbox and Google Drive to collaborate and sync project files. As photographers, editors, graphic artists, technical writers, and reporters, we continue to strengthen our skills and develop new ones, preparing ourselves for future projects.

Title: Assistant Editorship at *2 Bridges Review*
Student Researcher: Michael Youmans
Faculty Mentor: Prof. George Guida
Department: English

Michael Youmans's work at *2 Bridges Review* has been both educational and rewarding. As one of the journal's two Assistant Editors, he reads and evaluates many short stories from writers of diverse backgrounds and writing styles, dealing with various themes. When Youmans likes stories, he recommends them to the editorial board, who make final publication decisions. Immersing himself in these original works has enabled him to become a more proficient writer and editor. The *2 Bridges* editorial staff consists of three established writers, Editor-in-Chief Kate Falvey, Poetry Editor George Guida, Fiction Editor Rita Ciresi, Managing Editor Stephen Soiffer, Founding Editor Monique Ferrell, and Assistant Editor Louisa Ballhaus, who bring quality and high standards to the journal. Youmans is also active in publicizing and marketing the journal. For these reasons, he can think of no better reward for a student writer than to be a part of this great publication.

Title: Local 6 NYC Chronological Record of Significant Events
Student Researcher: Blanca Cortes
Faculty Mentor: Prof. Patrick O'Halloran
Department: Hospitality Management

Local 6 NYC grew out of the struggles of hotel and restaurant workers that were punctuated by strikes in 1912, 1926 and 1934, none of which were successful but all of which convinced workers that only a strong union could protect them against conditions of virtual slavery imposed upon them by unscrupulous employers.

Title: In-Demand Computer Literacy Skills For Hospitality Professionals
Student Researcher: Jovany Bravo
Faculty Mentor: Prof. Patrick O'Halloran
Department: Hospitality Management

Computer literacy skills for hospitality professionals are becoming more widespread. While most hospitality professionals appear to have reasonable computer skills, the level of their skill sets is not uniformly high. In fact, many hospitality professionals lack a sufficient level of skills to use "new" technologies including full use of web-based flexible learning. There appears to be an urgent need for training which should be introduced at high school and college levels so as to achieve successful outcomes to satisfy the needs of future employers.

Title: Exploring Gluten and Dairy-Free Baking
Student Researcher: Jodian Laird
Faculty Mentor: Prof. Louise Hoffman
Department: Hospitality Management

This research is being conducted to figure out which flours, sugars and non-dairy products could be used to create a "respectable" vegan and gluten free cake. Respectable, in which light and fluffy, not oily, no after taste or overpowering flavor, and holds together well but not dense or doughy. The ingredients in the vegan gluten free cake produced a cake to industry taste and texture standards. Multiple experiments were performed to create an almond coconut cake without using any gluten containing flour (wheat, spelt, or bulgur), eggs, butter, milk, cream or granulated sugar. The constant used was an almond coconut cake made with all purpose white flour, eggs, granulated sugar and butter. There were 5 different variations made with gluten and dairy free combinations. The results were photographed to record the progress of the texture of the cakes to compare them to each other and the constant. After the "respectable" cake was created, multiple fillings and icings were used to embellish the cake. It was very difficult to do this because wheat and eggs are the actual structure of cakes. Different fats also gave the cake different textures and different types of sugars influence the flavor of cakes. Each flour combination added to the flavor and the texture of the final cake produced. The final cake included a blend of white rice starch, tapioca starch, coconut flour and almond flour with vegan butter, turbinado sugar and flax eggs (ground flax seeds and water). It was filled with an almond

butter and iced with chocolate ganache, which took the cake to the next level. As a result of this cake future bakers can alter this recipe and make various gluten and dairy free cakes.

Title: Beyond the Event: The Environmental Impact of Event Tourism
Student Researcher: Angela Siu
Faculty Mentor: Prof. Gerald Van Loon
Department: Hospitality Management

Decades of research have sought to understand the social and economic impact of hallmark and mega-events on host communities. One understudied factor is the environmental legacy of these kinds of events. The concept sustainability, while complex, has become central to most discussions assessing tourism activities. Despite being commonplace among tourism conversations, the concept of sustainability, specifically, the concept of long-run environmental sustainability receives little attention within the discourse of hallmark and mega-events. This paper reviews and evaluates the nascent literature relevant to environmental sustainability and to hallmark and mega-events. Such scholarship is a precondition and a spark for substantial and useful research.

Title: Domestic Violence and the Impacts on African American Women: A Brief Overview on Race, Class and Root Causes
Student Researcher: Natalie Jones
Faculty Mentor: Prof. Christine W. Thorpe
Department: Human Services

Domestic violence is an intricate and complex issue that permeates society in different countries, religions, cultures, ethnic/racial groups, irrespective of sexual orientation, and among varied class stratification. Despite major interventions of the criminal justice system, and a sizable number of service providers, domestic violence has become a major public health concern. In accord, victims of domestic violence from ethnic minority groups have a higher impact rate and less effective intervention services available to them, compared to Caucasian women. African American women and many other minority groups have experienced traumatic if not lifelong psychological impairment due to partner abuse, and lack of intervention services that fail to fully apply comprehensive methods that can meet the victim's needs. In order to comprehend the individual's experience, one has to consider the varied factors and elements, and apply them in a conceptualized structured format. This paper provides an awareness of a pervasive issue experienced by African American women in urban communities. We will briefly explore how racial inequalities, class stratification, and ethnocentrism have vast influences and are structural root causes to applicable and effective services for women of color.

Title: Wheel of Fortune: An Information Theory Approach
Student Researcher: Peter Danshov
Faculty Mentor: Prof. Johann Thiel
Department: Mathematics

Wheel of Fortune is a game show variant of hangman. The player who performs best during normal play gets an opportunity to win a larger prize be solving a bonus round puzzle on their own. The goal of this project it to analyze and devise strategies to improve a player's chance of solving the Wheel of Fortune bonus round puzzles. We use regular expressions in PERL and ideas from Shannon's information theory in our analysis.

Title: Core Partitions of Numbers
Student Researcher: Dekuwin Emmanuella Kogda
Faculty Mentor: Prof. Corina Calinescu
Department: Mathematics

A partition of an integer number is a way to break the number into smaller parts. We represent a partition by its Young diagram. Each box of the Young diagram has an associated number, called hook length. A partition is called t-core, where t is any positive number, if the corresponding Young diagram does not have boxes of hook length equal to t. In this project we study the core partitions and their applications in some areas of mathematics such as representations of the symmetric group and representations of Lie algebras.

Title: Chaos Theory and it's Applications
Student Researcher: Kenneth Perera
Faculty Mentor: Prof. Sheila Miller
Department: Mathematics

Much of modern-day mathematics and sciences can be described using nonlinear relationships. So, how can we study behavior that is non-linear? That is what chaos theory is for! Chaos theory is a very hot topic amongst scientist and is defined to be the area of mathematics which attempts to understand different types of behavior that are non-linear. To the general public chaos is defined to be randomness; however, the true definition of chaos is that it is the study of systems that follow a specific set of rules or functions that produce complex behavior. Complex systems always display non-linear behavior and play a huge part of the study of chaotic behavior. The purpose of this research project is too understand the basic concepts that underlies chaos and how chaotic behavior applies to a number of situations in our world. This is done by exploring cellular automata, extensive readings and deepening our critical thinking process with relation to non-linear systems and behavior.

Title: Mechanical Characterization of Tissue-Engineered Scaffolds with Polydimethylsiloxane
Student Researcher: Yekaterina Ulanova
Faculty Mentor: Prof. Ozlem Yasar
Department: Mechanical Engineering and Industrial Design Technology

Within the field of tissue engineering, man-made scaffolds are fabricated to help cells thrive. In order for their mechanical properties to be tested, the scaffolds need to be engineered precisely. In the Laboratory for Engineering Tissue Systems at CUNY, City Tech, scaffolds were created out of Polydimethylsiloxane (PDMS) using molding techniques. In this technique a mold is produced with a 3D Printer. After that, liquid PDMS is poured on the molds and baked in the oven. After the baking process, the mold is removed from the solidified PDMS to get the scaffolds. One of the biggest challenges in this technique is, removing the air bubbles from the liquid PDMS. Although increased time in the vacuum assists in decreasing the amount of air bubbles, they can not be removed completely. In the future, a mold out of aluminum will be designed with a CNC machine to further research. Once the fabrication is completed without any bubbles, mechanical characterization will be conducted to examine the mechanical properties of the tissue constructs.

Title: Mechanical Tests of Polyethylene Glycol Diacrylate Based Tissue Scaffolds
Student Researcher: Peter Pena
Faculty Mentor: Prof. Ozlem Yasar
Department: Mechanical Engineering and Industrial Design Technology

Tissue engineering is a growing medical field where cells are reproduced for multiple uses; however the correct environment needs to be present for cells to not just be able to reproduce successfully but with the desired precision and shape. This environment will be scaffolds carefully built, using photolithography, to achieve the high level of detail and precision needed.
IN this research, photolithography is used to solidify a light-sensitive chemical, photo-initiator and polyethylene glycol diacrylate (PEGDA), by exposing it to UV light. PEGDA exposed to the UV light is controlled using a mask, placed between the PEGDA and the UV lamp, allowing a desired shape to be formed as the unexposed region will stay in its liquid form while the rest solidifies. A short time is required for the liquid to solidify, approximately 30 seconds, and by rearranging the mask and repeating the process layers are built over each other, which will give us a high detailed and precise product. After solidification is complete mechanical tests are performed to obtain the stress and strain of the material.

The significance of the fabrications and tests of these scaffolds is to test the viability of these scaffolds with their intended use of cultivating tissue cells to ultimately be transplanted unto a host. Developing the technique of controlling the pore size, shape and mechanical properties is the first step in achieving this goal.

Title: Development of a Gas-Actuated Turbine-Driven Loading Mechanism
Student Researcher: Daniel Frederick
Faculty Mentor: Prof. Angran Xiao
Department: Mechanical Engineering and Industrial Design Technology

Continuing with the previous semester's research, the goal this semester is to evolve the design of the turbine device. The turbine is intended to drive loading mechanisms such as those used in pneumatic-tools or light weapons that require reloading after each use. Using the loading mechanism of a traditional rifle as example, the current design diverts a portion of the high pressure propellant gas, generated from the firing of gunpowder, to agitate a piston and there by unlock the mechanism from the barrel, expel the spent cartridge and then reload. Such a mechanism consists of multiple intricate parts requiring frequent cleaning and maintenance. The turbine driven concept replaces the piston with a turbine fixed on the barrel. When the firearm is fired the portion of the propellant gas is diverted through the turbines' exit nozzle producing thrust and causing the turbine and therefore the attached barrel to rotate. This motion allows the loading mechanism to unlock, eject and reload. Comparing to the traditional loading mechanism, the turbine concept provides a simpler and more streamlined operation which could result in lower production cost and higher maintainability.

Using 3D printers to make the prototypes, last semester's research sought to prove the concept of a turbine based on the Aeolipile. Minimal gas exit velocity and torque arm contributed to the device's initial failure. A model was built that corrected those flaws and the device functioned as intended. However that version is not practical. Research will now focus making a prototype that is closer to realistic dimensions as well as examining different types of turbines that will improving functionality while reducing internal stress and will also endeavor to find new and uses for this device.

Title: CAD/CAM Integration in Injection Mold Designs
Student Researcher: Ricardo Clarke
Faculty Mentor: Prof. Angran Xiao
Department: Mechanical Engineering and Industrial Design Technology

Injection molding is a manufacturing process for producing parts by injecting material into a mold. Injection molding can be performed with many materials, but is gaining popularity in plastic product manufacturing, due to the development of new plastic materials. After a product is designed by designer, molds are made by a mold maker and precision-machined to form the shape of the desired part. However, due to its complex geometry, injection molds are expensive to make. A simple mold can cost $10,000 and usually take month to deliver. We explored the possibility of integrating CAD and CAM software in the mold design/manufacturing process. A product is designed using CAD software Inventor. Then the models of the mold parts are generated from the product model. To test the effectiveness of the mold design, plastic molds are made using a 3D printer, and silicon rubber is injected into the mold cavity to make copies. The future work of this project will be to integrate CAM software such as MasterCAM to generate machine code which will be used by CNC to make the injection mold with metal.

Title: The Application of Analyzing Material Density Using Sound Waves
Student Researcher: C. Daniel Thomas
Faculty Mentor: Prof. Angran Xiao
Department: Mechanical Engineering and Industrial Design Technology

A lot of technologies have been developed to identify the composing material of an object. However, most of these technologies are expensive and very energy consuming. It will be greatly beneficial if we can develop these technologies on a miniscule scale and apply them in many aspects of our everyday life. In this project, we are developing a garbage can that is capable of automatically distinguishing several major categories of waste (paper, metal and plastic) and dispensing them in designated areas. We studied the technologies used in the industry, and proposed to distinguish garbage using density. That is, objects with different densities will cause different changes to a sound signal passing through the objects. By analyzing the changes of frequency, amplitude or phase of the signal, it is possible to estimate the density of an object and hence distinguish the category it belongs. Matlab program is being developed for signal analysis. We plan to publish the finding on a technical journal if this idea is effective.

Title: Mentoring Among Registered Nurses: A Literature Review
Student Researchers: Emily Kheluram, Anyelina Genao, Ayanna Austin
Faculty Mentors: Profs. Elaine Leinung and Aida Egues
Department: Nursing

Peer-to-peer mentoring has long been recognized as beneficial to the development of students, practicing nurses and faculty, nonetheless there has been a lack of an established mentoring history in nursing. Even though, nursing has been a profession viewed as nurturing and that supports new nurses, it has been acknowledged that senior nurses “eat their young” leaving new nurses to learn in a “do or die” manner.

Data sources such as published journals and books on mentoring in nursing were used to understand the positive impact of nurse-to-nurse mentoring. Studies showed that when a novice nurse is mentored by an experienced nurse he/she thrives in their environment and is able to maintain an effective level of professionalism throughout their career. Thus, peer to peer mentoring has proven to promote empowerment and knowledge-sharing by the peer mentor helping or guiding another individual/ peer mentee in his or her career.

Further research in this area can lead to education in the importance of peer to peer mentoring and how mentorship would facilitate nurses to transition in their professional roles. In today’s rapidly changing health care environment, our research has aided us in understanding the effects of mentoring so that programs can be developed to promote successful leaders and professional development in the nursing profession.

Title: The Higgs Boson and the Large Hadron Collider
Student Researcher: Danielle Telemaque
Faculty Mentor: Prof. Andrea Ferroglia
Department: Physics

The discovery of Higgs bosons in the high-energy proton-proton collisions observed by experiments at the Large Hadron Collider at CERN in Geneva, Switzerland, marked the beginning of a new chapter in the history of elementary particle physics. The Large Hadron Collider is a circular collider of clockwise and counterclockwise beams of protons streamed towards each other at velocities which are close to the speed of light. As of 2012, the Large Hadron Collider was operating at 8 TeV (Tera electron Volts) with a future goal to reach a center of mass energy of 14 TeV.

The existence of at least one kind of Higgs boson is predicted by the Standard Model of particle physics. The latter is the theory that allows scientists to obtain quantitative predictions about the outcome of particle collisions. The goal of this project was to understand the relationship between the spontaneous symmetry breaking mechanism, which is responsible for the masses of all particles in the Standard Model, and the Higgs boson.

We have explored the Higgs boson's production and decay mechanisms, as well as the implications of finding a 125 GeV Higgs boson on the prediction of the W-boson mass and the weak coupling constant. A general qualitative introduction to the Standard Model of elementary particles was obtained through a critical reading of "The Particle at the End of the Universe" by Sean Carroll.

Title: Who Runs the World: QPSK - Understanding Phase Shift Keying for Communication
Student Researcher: Fauziya Sani
Faculty Mentor: Prof. Lufeng Leng
Department: Physics

Phase shift keying (PSK) is a large class of digital modulation schemes and is widely used in the communication industry. In PSK, information is conveyed by changing, or modulating, the phase of a reference signal called the carrier wave. For example, binary phase shift keying (BPSK) has two different phases on a plane to represent two binary values and each phase stands for one bit, and quadrature phase shift keying (QPSK) has four different phases which are used to represent two binary values and each signal represents two bits. The main objective of this project is to understand the basics of PSK in general but with emphasis on QPSK due its wide implementation. In particular, the formation of a QPSK symbol, the bits it represents, its constellation diagram, and its advantage over other schemes are discussed.

Title: Automated Computation of Scattering Amplitudes
Student Researcher: Daniel David Madray
Faculty Mentor: Prof. Giovanni Ossola
Department: Physics

We studied interactions between particles with the use of Feynman diagrams. Each diagram is the representation of a mathematical expression, which is the integral of a rational function. When we compute the integrals represented by these diagrams, they produce infinities or, in other words, unusable results. In order to gather usable information from these integrated rational functions, and to undergo the renormalization procedure, such integrals should be treated using techniques such as dimensional regularization or cut-off regulators. In this project, we focused on the regularization of the ultraviolet region using the techniques mentioned previously.

Title: Dynamics of Bose-Einstein Condensate of Microcavity Polaritons
Student Researchers: Ishtahad Ahmed, Marieme Toure, Mohammad Zilon
Faculty Mentors: Profs. Oleg Berman and German Kolmakov
Department: Physics

We study the dynamics of Bose-Einstein condensate of microcavity polaritons. The polaritons are formed by the superposition of the excitons in a semiconductor quantum well embedded into an optical microcavity and microcavity photons. The asymmetrical elliptical harmonic trap is created by the mechanical stress applied to the quantum well. We calculate how the spatial distribution of the density profile of the polariton condensate changes in time. The results are obtained by solving two-dimensional non-equilibrium Gross-Pitaevskii equation for the polariton condensate wave function taking into account the fact that the number of polaritons is not conserved due to the creation of polaritons by laser pumping and finite life time of polaritons due to the leakage of photons from the microcavity.

Title: Emotional Stress, Meaning-Making and Well-Being
Student Researchers: Curtis Appiah, Cherishe Cumma
Faculty Mentors: Profs. Jean Kubeck Hillstrom, Ernie Cote, Pa Her and Eleanor Strehl
Department: Social Science

Research on the effects of expressive writing consistently shows improved health and well-being outcomes. In Pennebaker's (1997) expressive writing paradigm, participants are instructed either to write about emotional events or neutral topics over several sessions. Those assigned to the emotional writing condition typically display physical and psychological health improvements over time compared to the control condition (Pennebaker, 1997). This study expands Pennebaker's (1997) expressive writing paradigm to include a positive reframing (meaning-making) condition. A second major difference is that our study assesses physiological responses (e.g., heart rate, vagal tone) during the experimental sessions. Twenty subjects (9 males, 10 females), ranging in age from 18 to 49 years of age, with a mean age of 26.8 years (sd = 9.04) served as participants. Subjects were randomly assigned to one of the three experimental conditions: standard writing (n=8), meaning-making (n=7), control (n=4). Subjects wrote for at least two sessions and most wrote for three sessions (n=13). A repeated-measures ANOVA comparing the first to the last writing sessions within-subjects shows a trend

towards greater improvement in vagal tone over time, $F(2) = 1.553$, $p = .242$. Post hoc analyses suggest that vagal tone improved for both expressive writing conditions compared to the control group with a slightly higher improvement for for subjects in the meaning-making condition. No changes were found in heart rate over time, $F(2) = .059$, $p = .943$. The results of this exploratory pilot study show that expressive writing results in improved vagal tone and suggest that the effect is greater for the reframing condition.