Hunter College Undergraduate Research Conference

Proceedings

April 5-6, 2017

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### Oral Presentation Session 1: Wednesday, 9:30am - 11:30am
**3rd Floor Glass Cafeteria**

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Phosphate protection of Rahnella aquatilis’s lipid A

Humans are exposed to bacteria on a daily basis, either through food consumption, the air we breathe or simply by having contact with surfaces. Some of these interactions could potentially be harmful, others present no risk whatsoever, or can even be beneficial to our wellbeing. These interactions are possible thanks to the components found on the surface of bacterial cell membranes, which have the capacity to stimulate human cells based on their structure. Previous studies done by our lab suggests a relationship between the Lipid A molecule of the gram-negative bacteria Rahnella aquatilis and a safe stimulation of human immune cells. Studying the structure of this lipid could potentially lead to the development of an immunological adjuvant, aiding in the process of fighting disease. We intend to chemically analyze the structure by extracting the lipopolysaccharide portion out of the bacteria and then proceed to hydrolyze and purify the lipid A molecule. However, the characterization process has been difficult due to the poor solubility properties of our lipid. The phosphate groups present in the molecule leads to its aggregation and it has been difficult to characterize by Electrospray Ionization Mass Spectrometry (ESIMS). As a consequence, we are currently testing methods of phosphate protection in our molecule, including benzylation using benzyl chloride and methylation using trimethylsilyldiazomethane. Successfully protecting the phosphate groups of the lipid would help in the characterization of its structure, permitting us to exploit its therapeutic potential.

Assessing Fibrillogenesis of a Single Sequence Unit Collagen-Mimetic Peptide

The synthesis of collagen-mimetic peptides has a wide variety of potential applications in biotechnology and medicine. Any such application will require a fundamental understanding of the peptides’ self-assembling properties. Like natural collagen, some synthetic peptides are known to assemble into a supramolecular fibril structure upon formation of the triple helix. The Col108 monomer is one such peptide, and is made up of three repeating sequence units known as U1, U2 and U3. Electron microscopy shows that Col108 forms long and smooth fibrils similar to natural collagen. The proposed basis for this structure is a mutual staggering of one sequence unit between triple helices, which leads to favorable interactions between residues on adjacent triple helices to form a stable complex. Further, the striated pattern observed by EM is characteristic of both natural collagen and Col108, and is attributed to the staggered arrangement forming a “gap” and an “overlap” zone. A deeper understanding is gained by assessing fibrillogenesis after reducing the number of sequence units to two and one. Peptide 2U108, containing two units forms a similar fibril to that of Col108. The purpose of the current project is to determine if a one sequence unit peptide, 1U108 is sufficient for fibrillogenesis; it is hypothesized to not be the case since the same mutual staggering of one sequence unit cannot occur. Protein purification from an E. Coli expression system with recombinant DNA technology is used, followed by biophysical analyses to characterize the resulting structures.
### Synthesis of Acridones

From readily available starting material phenols, bioactive acridones can be synthesized in two steps via a quinol intermediate.

### Rhetoric, Retweeted: An Analysis of the Rhetoric of Social Media and Its Impact on Political Commentary

This past semester, for my class Democratic Rhetoric: Hillary Clinton and Beyond taught by Professor Wendy Hayden, I wrote three connected papers concerning the rhetoric of social media in regards to political commentary. The purpose of my research was to assess the impact of social media on political commentary by analyzing the rhetoric of Twitter and Facebook posts made by journalists, pundits, politicians, and politically active citizens. Through my research, I collected the tweets of political pundits such as Tomi Lahren and Bill Maher and juxtaposed them against my own tweets reacting to the three presidential debates leading up to the presidential election of 2016. I analyzed the rhetoric of these tweets and also considered tweets put out by the presidential candidates themselves over the course of the election. Through my research, I have concluded that because the format of such platforms as Twitter compel users to write with brevity, political commentary today is not shaped by lengthy articles and op-eds, but by succinct, punchy tweets of 140 characters or less. Additionally, because posts online are written with the option, and often intention, of being shared, or spread across the Internet, writers and creators (regardless of their position as constituent, professional reporter, or elected official), feel an inherent pressure to withhold any potentially unpopular arguments or opinions in favor of generating popular content. However, social media does not necessarily devolve the value of political commentary, but can enable a greater expanse of Americans to engage in political analysis.

### Assessment of Unmanned Aerial Systems’ (UAS) Impact on Bottlenose Dolphin Behavior

Traditionally, behavioral observations of cetaceans have been conducted from vessels following a focal group of animals. While observations gathered using manned ships are the basis for much of our knowledge of the species, vessel activity has been shown to disrupt the behavior of wild dolphins, potentially introducing bias and disturbing animals. Emerging methodologies using Unmanned Aerial Systems (UAS) equipped with high-resolution cameras provide many advantages over traditional observation methods, allowing for detailed continuous data collection of dolphin behavior, while allowing the research vessel to remain stationary at a distance, minimizing acoustic disturbance from the boat. However, before researchers can effectively apply these systems in field studies, the potential impact of the UAS on behavior of focal animals must be assessed. This study sought to determine the behavioral responses of bottlenose dolphins (Tursiops truncatus) to the presence of a UAS. Focal animal follows were conducted on coastal bottlenose dolphins at the Turneffe Atoll Marine Reserve in Belize. Footage was collected using a remote-controlled multi-rotor UAS deployed from a small research vessel. An ethogram was created and used to describe and
1. **Presenter:** Elizabeth Gorodetsky, *Biology*  
   McNulty Scholars Program, Sage Honors, Hunter Undergraduate Research Fellowship  
   Co-Authors: Luca Parolari, Jeffrey Friedman  
   Faculty Mentor: David Foster  

   **Investigating the Role of The Subthalamic Nucleus in Psychiatric Diseases**  

   Altered activity in the Subthalamic Nucleus (STN) is a trait of both Parkinson’s Disease and Obsessive Compulsive Disorder. We intend to confirm the role of the STN in mediating both locomotor and emotional behaviors in mice, and identify and describe the cortical neuronal populations that modulate these diverse functions in the STN. We measured the consequences of pharmacologic hyperactivation and inhibition of the STN neural activity in mice by performing various behavioral paradigms assessing for PD- and OCD-like phenotypes. To dissect the specific cortical inputs to the STN involved in locomotor vs. emotional behaviors, we performed TRIO tracing and Retro-TRAP. Pharmacologic inhibition of the STN decreased grooming and increased locomotion in mice. TRIO and Retro-TRAP preliminary results will allow the dissection of the functionally distinct populations. These results confirm a role for the STN in modulating motor and emotional functions in mice. Anatomic and molecular identification of the neurons mediating these distinct functions will provide essential information to develop more efficacious therapeutics.

2. **Presenter:** Victoria Mroz, *Biology*  
   McNulty Scholars Program  
   Co-Author: Danielle Ompad  
   Faculty Mentor: Sel Hwahng  

   **Female Primary Relationship Partners and HIV Risk Among Drug-Using WSWM of Color**  

   Low-income heroin-, crack-, and cocaine-using African American and Latina women who have sex with women and men (WSWM) are an under-researched yet high-risk HIV population. HIV seroprevalence among drug-using WSW, including WSWM, ranges from 12.8% to 53% in New York City. Drug-using WSWM comprise a sizable portion of drug-using women of color and have been shown to be at higher HIV risk than drug-using women of color who have sex with men only (WSMO). A study of 90-minute interviews with drug-using WSWM of color (n=10) and participant-observation (N=35) in their communities was conducted in New York City in 2011. All women had experienced lifetime sexual victimization, 9/10 experienced childhood sexual abuse, with women who were involved in primary relationships with women (WPRW) experiencing the most extreme forms of child sexual abuse. Only WPRW engaged in sex with men for drugs and/or money. Some partnered with men as a front in order to pursue relationships with women. WPRW also tended to have sex with multiple male partners, drug-using men, and men who have sex with men and women. WPRW also provided specialized sexual services to men and were considered unused because of their gay status. Injection drug usage was only found among WPRW. Because the drug-using social economy is male dominant, WPRW were more limited in their access to resources (drugs and/or money) compared to women with male primary relationship partners. Future directions include a larger study testing our hypothesis to create effective HIV interventions and policies for WSWM.

3. **Presenter:** Fayola Levine, *Biological Sciences*  
   McNulty Scholars Program, McNair Scholar's Program, Hunter Undergraduate Research Fellowship  
   Co-Author: Olorunseun Ogunwobi, Leng Chee Chang  
   Faculty Mentor: Olorunseun Ogunwobi
### Effects of Novel Compounds Extracted from Hawaiian Plants on Pancreatic Cancer

Pancreatic cancer (PC) has a very dismal prognosis. 71% of PC patients will die within the first year of diagnosis and only 8% survive more than five years. The prognosis is extremely poor and is due to the lack of an effective strategy for early detection of the disease. The average life expectancy after diagnosis with metastatic disease is just three to six months. The Ogunwobi lab is testing the effects of novel bio-active compounds, which may have anti-tumorigenic properties, on metastatic PC. A panel of 8 compounds were tested, of which all were soluble in dimethyl sulfoxide (DMSO). PPE 28A, PPE 28 OAC, P2, BF11-1, BF11-2, BF11-3, BF11-7 and red algae were tested. This study is aimed at investigating the effects and molecular mechanisms of action of these compounds on the PC cell line, PANC-1. Using this in vitro model, we performed dose-response experiments in order to determine at what concentration the compound reduces cell proliferation. We evaluated the effect of the compounds on cell viability with the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) cell viability assay. Our preliminary results suggest that these compounds may have different efficacy in decreasing cell viability. BF11-2 exhibited the most inhibitory effect with a 20-25% decrease in cell viability at 10 µg/ml. We conclude that modifications to improve the potency of BF11-2 may make it a potential future therapy for use in the treatment of PC.

**Presenter:** Carina Sirochinsky, Chemistry  
**McNulty Scholars Program**  
**Co-Author:** Herman Pontzer  
**Faculty Mentor:** Hiroshi Matsui

### Effect of Intracellular Polymerization of Peptide on Exosome via Integrin Membrane Expression

Organ specific metastases of different cancers (e.g., breast cancer to the lung, pancreatic cancer to the liver) have been linked to exosomes. Exosomes are small vesicles (30 – 150 nm) containing protein, RNA, and DNA, capable of targeting specific tissues due to organ specific integrins displayed on the membrane surface. Due to their inherent targeting abilities and biocompatibility, our lab engineered exosomes for targetable drug carriers. To translate this approach to clinical applications, we attempted to amplify the production of exosomes in a daughter strain of metastatic mammary gland cells, MDA-MB-231-4175, which exhibits lung-tropic metastasis due to exosome membrane expression of ITGα6β4, which binds lung-resident fibroblasts and epithelial cells. Previously, we discovered that a short, chemically modified peptide sequence, NapFFKYp, was polymerized intracellularly, catalyzed by alkaline phosphatase and tyrosine phosphatase, triggering gelation around the cytoskeleton and influencing actin expression. Through NanoSight analysis, we found that the number of total microvesicles released by the cell was directly correlated to the concentration of monomer introduced to the cells, however the number of exosomes-type microvesicles did not increase. Using CytoFLEX, a high resolution FACS system, we were able to determine that although the exosome number did not increase with monomer concentration, the ITGα6β4 expression increased. Thus, in effect, treating cells with our monomer makes their exosomes more efficient at targeting metastatic sites. By further studying the relationship of the actin-polymer interaction to integrin expression pathways, we can figure out how to reduce or completely reverse integrin expression and reduce cancer metastases.

**Presenter:** Saipriya Iyer, Psychology  
**McNulty Scholars Program, Yalow Scholars Program, Thomas Hunter Honors Program**  
**Co-Author:** Jasmine Francis  
**Faculty Mentor:** Vanya Quinones-Jenab

### Efficacy And Toxicity Of Ophthalmic Artery Chemosurgery (OAC) With Or Without Intravitreous Melphalan (IVit) In Treating Retinoblastoma

Retinoblastoma is a type of eye cancer that affects children. A third of retinoblastoma eyes contain vitreous seeds, retinal tumors that break and float in the vitreous. Morphological characteristics...
differentiate seeds into three classes; class 3 describes clouds - large, diffuse conglomerations of vitreous opacities. Previously treated with enucleation, ophthalmic artery chemosurgery (OAC) and intravitreous melphalan (IVit) are currently considered powerful treatment alternatives. This study attempts to determine the efficacy and toxicity of OAC alone compared to OAC with IVit. A retrospective review was conducted of 38 retinoblastoma patients with class 3 vitreous seeds receiving different treatments (18 OAC, 20 OAC-IVit). Clinical reports and electoretinography responses determined ocular toxicity. Kaplan-Meier estimates measured ocular and disease-free survival, and time to regression. Other variables (age, laterality, disease status) were also measured. Age, laterality, and disease status showed no significant difference in either group. Ocular toxicity showed no significant difference between OAC-only patients (24µV) compared to OAC-IVit patients (22µV), (p=0.9). 18-month disease-free survival significantly worsened for OAC-only patients, 65.2% (95%CI 38.3-82.7), compared to OAC-IVit patients, 93.8% (95%CI 63.3-98.9), (p=0.05). 36-month ocular survival worsened for OAC-only patients, 61.0% (95%CI 28.3-81.5) compared to OAC-IVit patients, 100% (p=0.16). There is no difference in toxicity between OAC and OAC-IVit treatment. OAC-IVit improved ocular and disease-free survival, and significantly shortened time to regression. In conclusion, combination OAC-IVit is no more toxic than OAC alone, possibly allowing for quicker disease regression and fewer recurrences.

Wednesday, April 5th, 2017
Oral Presentation Session #2
2:00pm-4:00pm

11 Presenter: Jeffrey Garzon, Psychology
Faculty Mentor: Hilda Mundo-Lopez

**Psychological Warfare: Obtaining Power and Influence over Reality**

Consciousness is defined as a level of awareness that relies on the acquisition and integration of information. The ability to manipulate this information, how it is interpreted and how it is acted upon is a very old evolutionary survival mechanism. Information warfare is exhibited by countless species; perhaps most notably in the human civilization. You may lie to yourself to shield your ego. Perhaps you lie to your child to protect them from what they are too young to understand. Maybe you lie to your parents to protect them from what they are too old to understand. Some people even lie to their friends or the IRS. Deception clearly plays a very important role in our lives but what happens when this archaic art is converted into a science and used against you? Psychological Warfare (PW) is defined as premeditated tactics that convey selected information and indicators to audiences in order to manipulate their objective reasoning, motives, emotions and ultimately the behavior of groups, organizations, governments and individuals. Alternative facts, fake news and other forms of propaganda represent a dire public health crisis. Neuroeconomists and consumer psychologists cannot be permitted to use psychological research like illusory truth, framing and ambiguity effects to manipulate culture, economics, education and politics in favor of certain groups, individuals and organizations. Truthful knowledge is essential for a healthy identity, mental/physical hygiene and mental/physical health. The use of psychobiological insights to better control and exploit people is highly unethical.

12 Presenter: Daniel Hughes, Biology, Classics
Bluhm Fellow
Co-Author: Joey Verdi
Faculty Mentor: Jayne Raper

**Bioinformatics and PCR Mutagenesis Investigation Concerning African Variants of Apolipoprotein-4 (APOL4)**

The gene family of apolipoprotein-1 (APOL1)-APOL6 on human chromosome 22 consists of six
homologous genes in near proximity that arose through gene duplication. These genes evolved rapidly, likely due to positive selection via interactions with pathogens. APOL1 is secreted into the plasma where it combats African sleeping sickness by causing lysis of the infecting trypanosomes. APOL2-APOL6 are not secreted and may have evolved in relationship to intracellular pathogens. APOL1 protein variants that provide increased protection against trypanosomes called genotype 1 (G1) and G2 run a concomitant high risk of causing kidney disease among Africans and African-Americans. Some of the APOL2-6 genes may confer an increased ability to kill pathogens, and may also thereby damage host cells, as is the case with APOL1. Bioinformatics research via (1) the Variation Pattern Finder of the 1000 Genomes Project and (2) the ExAC browser, found two coding SNPs in APOL4 that cause missense variants and are specific to individuals of African ancestry: a shift at locus rs61730820, resulting in a lysine rather than a glutamic acid, that was found in only 2% of the surveyed genomes, with a specifically African character of 98% (46/47), and a shift at locus rs78582347, resulting in an isoleucine rather than a methionine, that was found in only 4.7% of the surveyed genomes, with a specifically African character of 93% (120/129). This research will use PCR mutagenesis to replicate these common African SNPs in APOL4 to test their effects on human cells and eventually intracellular pathogens.

**Smask: A New Future of Odor-Free and Pollutant Reduced Conscientious Smoking**

The intention of the device is to drastically mitigate the negative health effects caused by second-hand smoke. As observed in some preliminary testing of social environment smoking, people often have no regard for where they’re smoking (outside) and who is next to them, such as children and pets. This kind of irresponsibility has contributed to massive negative health repercussions as can be seen by its involvement in causing 41,000 deaths per year (American Lung Association). In order for people to use the device, it has to still preserve the "real feel" of smoking, which the Smask aims to accomplish. In order for the system to function, the unit uses a two chamber air-flow apparatus, with one dedicated to housing and lighting the cigarette, and the other for propagating smoke through a Carbon HEPA filter by means of a fan. All the user is required to do is insert their cigarette into the device, ignite it with a button press and then proceed to inhale from, and exhale back into the device. The drastic reduction has already been recorded in our research, however we have yet to finalize a handheld design for focus group testing.

**Queerness and Slavery in Inquisitional Brazil**

This work focuses on the existence and role of queerness on the part of enslaved Africans in Portuguese Brazil during the 17th and 18th centuries. During the height of slave importation, economic output, and the religious zeal of the Inquisition, scholars have begun to examine how sexuality is reflected within these sites. Through extensive primary source material, this research analyzes queer relationships and alternative conceptualizations of sexuality that took place between enslaved Africans as well as between the enslaved and their owners. The past decade have shown a renewed effort on the part of scholars of the Trans-Atlantic slave trade to understand more of the lived experiences of the enslaved in the Americas, including but not limited to sexuality. While there have been sources clearly outlining the existence of queer activity among enslaved populations in the past, the field is vastly unexplored due to historically flawed beliefs that queerness was anomalous behavior not worthy of further investigation. Interpreting the work of pioneers in the field of queerness and slavery such as Ronaldo Vainfas, James H. Sweet, and Gloria Wekker, I contend that queer activity between the enslaved and slave owners was used to reflect and supercharge the
position of the enslaved as an object for production and sexual pleasure.

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<th>Guadalupe Bermejo, Psychology</th>
<th>McNair Scholars Program, Hunter Undergraduate Research Fellowship</th>
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<td>Co-Author</td>
<td>Regina Miranda, Ariella Soffer</td>
<td>Faculty Mentor: Regina Miranda</td>
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**Tiny Shifts Online Intervention Study**

This study sought to identify ways of decreasing barriers to mental health treatment seeking among college students via use of the Inkblots Video series from the Healthy Minds Network. We hypothesized that engagement with the videos would increase hopefulness, positive mood, and decrease perceived barriers to mental health treatment seeking. One hundred forty-eight participants were randomly assigned to one of two conditions. Participants in the intervention condition received weekly emails with links to the inkblot videos; those in the control condition received weekly reminder emails that they were still part of the study. There was no statistically significant change in hopefulness or in perceived treatment barriers by group. However, participants who watched the weekly videos reported an increase in positive mood, compared to the control condition, suggesting that the videos improved participants' moods. This research has implications for targeting college students' mental health, beyond counseling centers.

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<th>Youn Nyo, Biochemistry</th>
<th>Yalow Scholars Program</th>
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<td>Faculty Mentor</td>
<td>Hiroshi Matsui</td>
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**Block Copolymers used in Drug Delivery**

Drug delivery methods using nanoparticles have made advancements over the past 20 years. In this project, we developed nanoparticle carriers from three block copolymers, PEG-poly-e-capro-lactone (PCL), PEG-poly lactic-co-glycolic acid (PLGA), and polystyrene-block-poly acrylic acid (PS-b-PAA), respectively. Our goal is to produce the block-copolymer vesicles containing magnetic nanocages inside the cavity. This hybrid nanoparticle has unique feature of drug incorporation inside nanocages for secure drug delivery. The incorporation of magnetic iron oxide nanocages will improve the resolution of MR imaging significantly. We discovered that the ratio of solvents such as Tetrahydrofuran (THF, non-polar)) and Dimethylformamide (DMF, polar) affect the structure of hybrid nano-carriers significantly. While PEG-PLGA block copolymer has been drawing attention as a very useful candidate for controlled drug delivery carriers, PSS-PAA polymer has an advantage that the final structure and size depend on the polarity of solvents. This project will provide a detailed description of the block copolymer assemblies that have not been studied extensively, the optimization of assembled structure for drug delivery, and understanding influence on their effectiveness in drug release.

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<th>Presenter</th>
<th>Alessandra Rosen, Linguistic Anthropology</th>
<th>McNair Scholars Program, Hunter Undergraduate Research Fellowship</th>
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<td>Faculty Mentor</td>
<td>Angela Reyes</td>
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**“Yoga is made for you”: Meta-voicing yoga brand and type**

In the global consumptionscape (Askegaard and Eckhardt 2012), identity is increasingly oriented to and mediated by brand identity. Consumption is no longer merely oriented to the materiality of a commodity, but is rather bound up in larger constructs of identity, values, and lifestyles, formulated in the process of marketing campaigns (Agha 2005; Nakassis 2012). In this study I examine how recognizable social types are formulated, and then reflexively linked to the yoga apparel brand Manduka™ and its associated commodity(s), thereby imbuing the brand and commodity with immaterial value. I argue that this reflexive linkage is achieved through a frame-on-frame mapping of
“voices” (Bakhtin 1981), or metavoicing. In the context of a specific social media advertising campaign, the Manduka brand voices social types, and these social types voice and ventriloquate yoga in accordance to their socially recognizable identity(s). Identifiable voices emerge through their juxtaposition across social media platforms. In turn, the Manduka brand achieves greater social recognition, allowing persons to align or dis-align with various socially identifiable types and their ventriloquation(s) of yoga as they are juxtaposed across a larger advertising platform.

As modern yoga is a product of transcultural exchange, whose “global flow” (Askegaard and Eckhardt 2012) has been largely mediated by brand identity, it offers a compelling example of a global consumption activity. The social types formulated and linked to the Manduka™ identity also contribute to a translation of yoga in terms of global consumption and brand identity.

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Presenter: **Kyra Wooden**, Psychology
Macaulay Honors College, Bluhm Scholar
Faculty Mentor: Amber Alliger

**Enriched Environment Housing Promotes Learning and Memory by Generating Increased Maturated Hippocampal Dendritic Spines**

Cognitive performance, such as spatial learning and memory processing, has been linked to dendritic spine density of the hippocampus. Therefore the goal of this study seeks to run correlations between spine density and reference and working memory performance by Spague Dawley male rats on a radial arm maze (RAM). With (N=24), 12 rats were raised in environmentally enriched housing (30 days) and 12 rats were raised in standard single housing (30 days) performed RAM. Brain neurons were stained using a Golgi method and the tertiary branches from areas of the hippocampus (CA1 and CA3) were imaged using a confocal microscope. It is hypothesized that enriched housing promotes increased spine density of mature spines (long thin and mushroom) which will be positively correlated with better working and reference memory performance on RAM. Using IMARIS for 3D modeling of the data, the number of mature spines was counted. A repeated ANOVA will be used to measure the number of spines and then will be correlated with reference memory and working memory scores from the RAM data. It is expected that environmentally stimulating housing for rats can support important affects on both behavior and brain structure through hippocampal neurogenesis, which this study measures through structural protein PSD-95 in mature spines. The presence of this protein has been associated with cognitive, learning, and memory processes.

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Presenter: **Julie Sorokurs**, English Linguistics and Rhetoric
Faculty Mentor: Angela Reyes

**From Orwell to Oswalt - Reappropriation and Recontextualization in Stand-Up Comedy**

In a 2010 podcast interview with stand-up comedian Stewart Lee, fellow stand-up comedian Marc Maron at one point exclaims that reducing stand-up comedy to the act of “joke-telling” is “demeaning to being a real stand-up.” He decries the idea of jokes as “these detached floating things,” characterizing it as “demeaning” to the process and intent behind stand-up comedy routines. In aligning “joke-telling” against “real stand-up comedy,” Maron complicates the role of stand-up comedy alongside other forms of verbal art and theatrical performance. Stand-up comedians typically referred to as “hacks” by other comics are reviled for exactly this inability to divorce themselves from the “joke-telling” persona so lazily attributed to them by audiences. Considering jokes as “these detached floating things” against a similar, Bakhtinian conception of words before they’ve been appropriated by an author, I want to juxtapose the decontextualized “joke” against Bauman and Briggs’ notion of contextualization, which suggests that context is resultant of an active negotiation between performer and participant(s). Verbal art is not only reflective of social values, but it is potentially transformative. I want to show that the comic hack refuses to consolidate that which emerges with that which is already familiar. Through discourse analysis I hope to highlight the recurring use of the word “hack” in Maron’s interviews and how it is juxtaposed against discussions...
of “staying true to oneself and one’s craft” within the stand-up community in an attempt to expand upon (and complicate) the place of stand-up comedy alongside other forms of performance.

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Presenter: Kayla Walsh, Environmental Science
Raab Presidential Fellowship Program
Faculty Mentor: Randye Rutberg

Is The Moon Wet? Recreating Sulfur Signatures Found In Lunar Apatite

The moon has long been believed to be a dry, rocky land devoid of any signs of water. Now, recent studies are turning our entire understanding of the moon upside down. This experiment analyzes the apatite crystal, found in abundance on earth and the moon. By exposing these apatite crystals to typical hydrothermal fluids that would be found in mafic systems present on earth and the primitive moon, we've drawn conclusions about what type of environment the apatite forms in on the moon - particularly whether the environment could be hydrous based on the S uptake. Solutions incorporating S are used to investigate the uptake of S in synthetic apatite crystals. By suspending these crystals in a double capsule apparatus wherein they were exposed to aqueous solutions containing combinations of HCl, NaCl, H2SO4, Silica and Sulfur these otherwise pure apatite crystals acquired an S signature. Comparing this signature to those found in lunar and terrestrial apatite provides further evidence of a hydrous lunar mantle. Electron microprobe analysis reveals high levels of S in the experimental apatite crystals, suggesting the natural incorporation of S in aqueous environments. The S partitioning coefficient reflects the high capability of apatite to incorporate large quantities of S in its structure with the presence of hydrothermal fluid. Scientists are interested in the increasing amount of data about water on the moon because it would open up a plethora of new opportunities for moon bases and sustainable living for periods of time on the moon.

Wednesday, April 5th, 2017
Oral Presentation Session #3
4:15pm-6:15pm

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Presenter: Janine Guerrier, Community Health
Hunter Undergraduate Research Fellowship
Faculty Mentor: Philip Alcabes

African Diaspora Clubs and Black Excellence project

This study is to examine whether enrollment in black identified organizations targeting students of the African Diaspora improves academic performance, encourages community involvement and heightens self-identity compared to students with no affiliation to such groups. Flyers and emails will be distributed in order to recruit potential participants. The participants of study will be black, 18 or older, full-time students. In order to determine if academic performance and community involvement are affected by African Diasporic clubs, information on club participation, GPA, credits, semester status, knowledge of resources, familiarity with faculty, and community involvement will be collected using a standardized survey instrument. This study aims to determine if student engagement in African diasporic clubs leads to better academic performance and/or community involvement.

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Presenter: Dennis Copertino, Biological Sciences
Faculty Mentor: Benjamin Ortiz

The Pathogenesis of Thrombotic Microangiopathy in the Setting Of Allogeneic Hematopoietic Stem Cell Transplant in Adults

Nearly 20% of the 7,000 bone marrow transplants, technically known as “allogenic hematopoietic stem cell transplants (aHSCTs),” performed annually in the U.S. result in a severe, life-threatening
syndrome, Transplant-Associated Thrombotic Microangiopathy (TA-TMA). Many suffer a special type of TMA, induced by the transplant, known as atypical hemolytic uremic syndrome (aHUS). It carries a very high death rate unless promptly treated. Current methods to recognize aHUS-type TMA occurring in the transplant setting are lacking. But, a genetic inability to regulate the alternative complement pathway has recently been implicated in an individual's susceptibility to aHUS. Plasma C5b-9 or MAC (membrane attack complex) and plasma C5a, an anaphylatoxin, are two complement components responsible for the endothelial cell injury, platelet activation, and inflammation, which are characteristics of aHUS. We therefore sought to utilize these markers of terminal complement component activity to recognize and, possibly predict, the development of an aHUS-type TMA following aHSCT prior to its clinical recognition. This would permit administration of possible life-saving anti-complement therapy. We hypothesized that, over time post aHSCT, plasma C5b-9 or plasma C5a -measured by ELISA- will increase prior to clinical recognition of a TMA or development of the classic laboratory signs of aHUS. In contrast, plasma C5b-9 or C5a of a person who does not develop aHUS post-aHSCT will not increase over time. We instead found that both groups have increasing and decreasing amounts of C5b-9 over time. Therefore we devised a scoring system based on baseline C5b-9 readings and the amount of deviation from normal values over time. This scoring system can help to predict those patients who will be susceptible to aHUS. Genetic analysis for complement mutations may also assist in this regard.

**Physical Activity Levels and Musculoskeletal Injury: An Evolutionary Perspective**

This investigation will involve collecting daily physical activity readings using accelerometers, on n=30 human subjects (age 18+) for a period of 2 weeks, or 14 days total. These participants will be of varying ages and genders. The goal is to compare their levels of and intensity of physical activity to previously collected and published data from Hadza hunter-gatherers and other traditional groups. The objective is to compare activity levels in 1) sedentary adults, 2) adults who exercise regularly, and 3) adults engaged in collegiate-level sports or high intensity exercise to people living traditional, hunter-gatherer lifestyles. Note: Hunter-gatherers tend to exercise moderately in a continuous pattern throughout the course of their day. On the other hand, individuals engaged in intensive exercise routines typically include long-term repetitive motions that may overwork a particular muscle group and cause injury. My hypothesis: Musculoskeletal injury occurs at high rates in strenuous exercisers because their training requires levels of physical activity that exceed those of traditional lifestyles, in which the human body evolved.

**Time-Dependent Density Functional Theory: Fundamentals**

Understanding and calculating electron dynamics and spectra is of great interest; it is these calculations that have allowed scientists to develop cutting edge technology in materials science, develop solar cell devices, control and manipulate molecules, and even study the yellowing of Leonardo Da Vinci’s self-portrait. In quantum mechanics it is postulated that every physical system can be described by a wave function that contains all observable information. If one could solve the associated time-dependent Schrödinger equation then one could, in principle, know the behavior of electrons in a system. In practice, however, solving the Schrödinger equation directly can be difficult when considering more than just a few electrons. The associated cost, both in terms of the computation itself and storage of information, can balloon dramatically when considering many-electron problems. Avoiding direct computation is at the core of Density Functional Theory. In 1964
Hohenberg and Kohn proved that for static cases one could find the observable properties of a many-electron system from the one-body ground state density, without direct calculation of the wave function. In 1984 Runge and Gross extended what Hohenberg and Kohn proved to the time-dependent (non-static) case; this marked the development of what is now known as Time-Dependent Density Functional Theory (TDDFT). Here I will present the proof of the Runge-Gross Theorems while discussing some of the wide applications of TDDFT.

### In Search of Biomarkers Associated with Benefit from Combination Immunotherapy in Melanoma

The use of immunotherapy, a type of cancer treatment designed to boost the body's immune system, has become increasingly common in treating various cancers including melanoma. The combination of two immunotherapy drugs, ipilimumab and nivolumab, was FDA-approved in October 2015 and has been effective in treating metastatic melanoma. However, it is still unclear which patients are most likely to benefit from combination immunotherapy. This study is the first to examine which clinical and immunologic variables correlate with overall survival outcomes of patients receiving combination immunotherapy. A retrospective review was performed of medical records of 122 melanoma patients who received ipilimumab and nivolumab in combination on clinical trials in the last six years. Levels of various blood biomarkers were investigated as they have been relevant in previous analyses of single-agent immunotherapy. Clinical endpoints were overall survival (OS) and best response by Response Evaluation Criteria in Solid Tumors. Kaplan-Meier estimators and Cox regression were used to analyze clinical data. Blood biomarkers were found to be significantly correlated with OS but not response rate. Low monocyte counts, low neutrophil counts, high eosinophil counts, high lymphocyte counts and low lactate dehydrogenase levels were associated with longer OS. These factors were similar to those associated with benefit from ipilimumab and nivolumab as single-agents. However, these factors only indicated a longer OS but not a better response rate, possibly suggesting they are prognostic, rather than predictive. More research is necessary to determine the predictive impact of these biomarkers by examining them in ongoing randomized, controlled studies.

### Improved efficacy of Chimeric Antigen Receptor (CAR) T-cell therapy by metabolic modulation of the tumor microenvironment

Although hormonal and radiation therapy are effective in prostate cancer, these treatments do not fully prevent metastasis formation in later stages of the disease. Prostate-Specific Membrane Antigen- (PSMA-) directed Chimeric Antigen Receptor (CAR) T-cell therapy is a new approach that is being tested in patients with prostate cancer metastasis. Our labs have developed animal models to study and optimize the anti-tumor PSMA-CAR T-cell immune response. Previous research has shown that CAR T-cell therapy alone is ineffective in reducing tumor burden in mice, and that the addition of PD-1/PDL-1 checkpoint inhibitors improves efficacy of anti-hPSMA CAR T-cells. Previous work in the Blasberg lab showed that high rates of glucose metabolism within tumors lead to increased levels of lactic acid and results in exclusion of immune cells from primary tumors. The lab also showed that T-cell exclusion could be overcome by decreasing rates of tumor glycolysis and lactic acid accumulation within the tumor microenvironment. Thus, we hypothesized that hPSMA-directed CAR T-cell therapeutic efficacy could be improved by reducing intra-tumor lactate in combination with PD1/PDL1 checkpoint blockade. This strategy could achieve a synergistic therapeutic benefit and
better control of tumor growth in our mouse models of prostate cancer. Thus far, we have shown that anti-hPSMA CAR T-cells are better able to infiltrate LDHA-depleted prostate tumors when compared with highly glycolytic control tumors. Further experiments are planned to add PD1/PDL1 checkpoint blockade to our treatment strategy, with an overall goal to improve CAR T-cell therapy in humans.

| 27 | Presenter: **Teresa Panurach**, Physics  
AstroCom NYC  
Co-Author: Matthew O'Dowd  
Faculty Mentor: Kelle Cruz |
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<td><strong>Understanding the Intergalactic Medium Through the Use of a Lensed Quasar</strong></td>
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<td>Quasars are among the brightest objects in the universe. In rare gravitationally lensed quasars, their light converges around an intervening lensing galaxy. We observe these quasars along multiple paths, resulting in multiple lensed images of the quasar. The light that follows these different paths encounters various parts of the intergalactic medium (IGM) and may show different absorption features, indicating the varying composition of the IGM. By analyzing spectra from a gravitationally lensed quasar, B1422+231, observed by the Gemini North Telescope, we estimate the intrinsic far ultraviolet (FUV) spectrum and compare the absorption features between lensed images to study the small-scale structure of the IGM.</td>
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| 28 | Presenter: **Christopher Mallia**, Physics  
Macaulay Honors College, Hunter Hunter Undergraduate Research Fellowship  
Faculty Mentor: Steven Greenbaum |
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<td><strong>Battery Technology of Tomorrow: Ionic Liquid Electrolytes for Better Lithium Ion Batteries</strong></td>
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<td>In the modern world, advancing technology creates a demand for suitable materials for high energy density and safe batteries, for use in electronic devices and electric cars. At the forefront of research into such materials are investigations on suitable electrolytes with applications in lithium ion batteries, which possess properties that increase the safety and efficiency of such devices. We investigate the ionic liquids BMIM-TFSI and EMIM-TFSI as well as Pyrolidinium-TFSI of varying chain length with the presence of Li-TFSI ionic salts using the techniques of Nuclear Magnetic Spectroscopy (NMR), and the experimental variation of NMR known as Fast-Field Cycling (FFC). Through these experimental methods, the molecular properties of these ionic liquids can be fully characterized and probed in order to examine their full potential as electrolytes in lithium ion cells. Pulse field gradient (PFG) experiments derive values of cation and anion self-diffusion rates, and subsequently probe the mechanism of ionic conductivity in these ionic liquids. FFC experiments provide a novel approach to investigating facets of ionic liquid behavior in the presence of varying magnetic fields, serving as a unique opportunity to examine specific molecular dynamics. In addition to being an alternate method of deriving diffusion rates for anions and cations, FFC results can be appropriately modeled to demonstrate the dominant relaxation mechanisms present in each system. Such characterization would broaden the knowledge of molecular dynamics for these specific systems and aid in the journey to discover and employ new candidate materials.</td>
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<td>Using Dense Hydrogen Clouds to Improve Galaxy Formation Models</td>
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<td>Jacob Hamer, Physics, Mathematics</td>
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<td>Kyle Fraser</td>
<td>'White As Pitch': Racialized Dog Whistles &amp; The Black Listening Subject</td>
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Targeting MYC Oncogene to Overcome Chemoresistance in a Novel Preclinical Model of Muscle Invasive Bladder Cancer

Bladder cancer (BCa) is the fifth most common cancer in the United States. The basal subtype muscle invasive bladder cancer (MIBC) has the shortest survival of approximately 25 months due to the onset of chemoresistance and associated toxicity. Therefore, there is a clinical need to understand how to sensitize bladder tumors to acceptable levels of chemotherapy and determine a novel treatment that will be effectively treat chemoresistant BCa. While human BCa cell lines exist, they may not reflect the complexity of human BCa and adaptation to treatments due to divergent evolution during the long-term in-vitro culture. To overcome this challenge, a novel mouse derived allograft (MDA) of MIBC resistant to cisplatin (CDDP), the most commonly used chemotherapy drug for BCa, was developed using a carcinogen, OH-BBN (0.1%, N-Butyl-N-4-hydroxybutyl nitrosamine). OH-BBN induced BCa was confirmed to represent basal subtype MIBC, which overexpresses the transcription factors, p63 and MYC. When the MDA was treated with CDDP, there was chemoresistance showing no significant decrease in the tumor growth rate. Only at a very high and clinically unacceptable dosage, there was a significant decrease in the tumor growth rate, however, p63 and MYC were still overexpressed. Furthermore, a patient derived xenograft (PDX) from MIBC patients who are experiencing chemoresistance was also adapted by implanting their BCa tumors into mice. The clinical samples have been confirmed to overexpress p63 and MYC. As seen in both the MDA and PDX models, transcription factors are overexpressed in cancer cells. Transcription factors, which drive gene signatures associated with normal organ development as well as aggressive cancer phenotypes, may be the key determinants of progression and therapeutic response. In the normal mouse genitourinary tract, p63-positive cells are necessary for the development of bladder and are capable of forming all cell lineages. This suggests that p63 may serve an equally important role in the basal MIBC etiologies. Targets of p63 with well-established oncogenic function include MYC, which is directly regulated by p63. MYC signaling, in other cancer types in which CDDP is commonly used, has been identified as a possible cause of resistance and a plausible therapeutic target. Since direct pharmacological targeting of p63 and MYC is challenging, an established bromodomain inhibitor (BETi), JQ1, has been used to inhibit MYC expression and function. JQ1 and CDDP were tested individually and in combination on the MDA and PDX. The average tumor volumes were compared, and results showed in both models that the effects of the combination treatment was significant (p<0.05). This suggests that the p63 signaling pathway drives MYC signaling to regulate progression and chemoresistance in MIBC. In the future, the combination treatment in an orthotopic mouse model can be investigated.

Indigenous Objects: From Social Mediators to Museum Artifacts

This research explores how indigenous objects change their meaning as they move from social field of production, use and destruction to museum collections. I examine theories of the autonomous agency of artifacts and anthropological perspectives on materialisation in Oceania to interpret native objects as active, both through their material qualities and their role in social practices. Gell conceptualizes artworks as mediators of social relations, emphasizing their functionality within specific social contexts. Bell and Geisman take this theory further by considering materialisation as a process of giving concepts and beliefs their material forms and focusing on processual qualities of objects. I investigate how indigenous objects lose agency through dislocation and recontextualization in museums and address problematic nature of museum displays. I examine Vogel's notions of aestheticization and attribution of new meaning to museum artifacts and Jacknis' account of the Northwest Coast Indian Hall at the American Museum of Natural History.
### Presenter: Ilana Deyneko, Biology
BP-Endure  
Co-Author: Hector Moran  
Faculty Mentor: Carmen Melendez-Vasquez

**Drug-Induced Inhibition of Microtubule Detyrosination Increases Central Nervous System Myelination and Oligodendrocyte Branching**

Multiple Sclerosis, a debilitating disorder that causes significant cognitive and physical impairments, is defined by the loss and degradation of myelin in the central nervous system (CNS). Myelination is a critical process since nerve impulses must be propagated through myelinated axons via saltatory conduction in order to maintain their high speed of transmission and efficient information processing. In the CNS, the type of glial cell that wraps axons in myelin, a lipid membrane, are known as oligodendrocytes (OL). These cells are also responsible for remyelinating damaged areas and protecting axons from further demyelination in cases such as MS. Our lab has shown that cytoskeletal proteins are crucial for promoting myelin formation and repair. Microtubules (MTs), a component of the cytoskeleton, are polymers made up of alpha and beta-tubulin, and are involved in the transport of myelin proteins and in the assembly and growth of the OL branches. Although the importance of MTs in the process of myelination has been explored, there are many questions about the exact mechanism of how they are involved. We are currently examining a MT-modifying drug that inhibits detyrosination of alpha-tubulin, thereby making the MTs more dynamic. The drug treatment has resulted in increased myelination in vitro. Additionally, results indicate that the drug causes increased branching in the OL. We are currently looking into the mechanism of how this post-translational modification affects myelination.

### Presenter: Philip To, Chemistry
Hunter Undergraduate Research Fellowship, Leon S. Cooperman Scholarship  
Faculty Mentor: Charles M. Drain

**Phosphodiesterases as Novel Therapeutics for Dopamine Dysregulation**

Dysregulation of Dopamine (DA), a neuromodulator essential for fine motor control and, is linked to a variety of neurological disorders such as Parkinson’s disease. DA mediates its cellular actions by regulating the intracellular levels of cyclic adenosine monophosphate (cAMP). Phosphodiesterases (PDEs), enzymes that degrade cAMP, are potential modulators of DA response and thus could be therapeutic targets to treat DA disorders. The cAMP signaling network shows remarkable complexity. For starters, the production of cAMP is membrane-delimited and since degradation activities are mostly cytosolic, cAMP accumulation in neurons is enhanced in subcellular areas of high surface to volume ratio, such as dendrites, resulting in spatial heterogeneity of signaling. Furthermore, multiple PDE families are expressed in a neuron, each PDE displaying varying kinetic features, suggesting that the degradation of cAMP throughout the neuron is not uniform. Given this complexity, we sought to understand the role of each PDE in the spatial heterogeneity of cAMP signaling in neurons with the goal of identifying promising PDEs therapeutic targets. Here, we developed a partial-differential-equation-based model of how PDE1, PDE2, PDE4 and PDE10 activities affect cAMP gradients to modulate DA response. The model also includes DA-dependent cAMP activation, cAMP activation of downstream effectors such as PKA. We explored the effect of dendritic diameter and DA receptor occupancy on the rate of cAMP degradation by each PDE in different subcellular locations in the neurons. Our results show that each PDE activity preferentially acts at a specific subcellular location and receptor occupancy. We found that PDE4 acts preferentially at low DA occupancy, whereas PDE10 and PDE2 act at areas where DA is more readily available. These findings suggest that inhibiting different PDEs may provide specificity to DA modulation.

### Presenter: Thalia Buxo, Psychology, Women & Gender Studies
Thomas Hunter Honors Program, Mellon Mays Undergraduate Fellowship (MMUF)  
Faculty Mentor: Hunter Kincaid
A Engendering a Rape Culture: How the perpetuation of a gendered society contributes to the maintenance of a rape culture

When discussing sexual violence and rape in relation to gender, it is quite often assumed that offences of this nature are gender specific and are perpetrated by men, and on women. While it is a fact that women face a higher risk of sexual victimization than men, it is imperative we do not forget in our discourse, that rape and sexual assault are gender neutral occurrences. Because the engendering of biological sexes assigns different roles to be played by those assigned as "men," versus those assigned as "women," rape and sexual violence have ultimately become acts defined by gender. Men rape, women get raped, or society believes. The truth is, there is no biological determinant for sexual predators; predators are not, and should not, be considered gender specific. The notion that men are biologically preordained to sexual aggression due to their inherent masculinity, and that women are preordained to be "submissive and passive" due their inherent femininity, leads to the dangerous ideology that acts of sexual violence are only perpetrated by men, and women cannot be sexual predators. This gendered assumptions of rape often overlooks "atypical" cases of sexual victimizations in which women are the perpetrators. In this presentation, I will be exploring this engendering of sexual violence that gave way to what is now referred to as a "rape culture"; a culture that supports the gendered assumptions of rape and sexual violence and accept them as inevitable and true, and supports the pervasiveness of gender exclusionary rape justice which serves to benefit no one.

| Presenter: Leslie Zhen, Psychology-Behavioral Neuroscience |
| BP-Endure |
| Co-Author: Rose Ng |
| Faculty Mentor: Peter Moller |

An Assessment of Methamphetamine-Induced Behavioral and Neural changes using Gnathonemus petersii, African weakly electric fish

Methamphetamine (METH)-induced symptoms such as restlessness and anxiety are well characterized, but the extent to which these changes can be modulated by hormonal manipulations is not. Gnathonemus petersii, African weakly electric fish, produce electric organ discharges (EODs) that reliably indicate learning and hormone effects. Using G. petersii will permit us to investigate the relationships between METH exposure and these resulting effects. There are currently no METH studies using this species. Our present research aims to (1) establish G. petersii as a model to investigate METH effects, and (2) assess dosages that can elicit observable behavioral and neural changes as measured by predictors of anxiety and hyperactivity, as well as fluctuations in telencephalic dopamine 1 receptor (D1), dopamine transporter, and tyrosine hydroxylase levels. Animals were treated with either low (2 mg/L), moderate (5 mg/L), or high (10 mg/L) dose METH dissolved in tank water. Fish were observed for time spent in a shelter, swimming, staying in the upper or lower areas of the tank, and respiratory activity. Control animals spent most of their time in the lower area, and progressively swam longer outside the shelter. EOD and gill rates increased during the first minute, and remained constant thereafter. These results provide the basis for assessing potential METH-induced effects such as increases in locomotor and electric activity, anxiety-like behaviors, and decrease in telencephalic D1 levels. Future studies that will investigate whether hormonal manipulations can mitigate these behavioral and neural changes may provide a framework for alternative interventions.

| Presenter: Sydney Hershenhorn, Political Science |
| Faculty Mentor: Charles Tien |

Food Access and Race in New York City

The food we eat has power to dictate how we live and enjoy our lives. Food access and inequality lies
deeply intertwined with race and income politics. This is especially observable in large metropolises like New York City. One finds that there is a disparity in the access to and availability of nutritious foods as we move borough to borough. I aim to observe these disparities and draw conclusions as to if racial demographics play a significant role in the availability of healthy foods in neighborhoods in New York City. Later, I will cross reference this availability of foods against specific limiting factors such as local legislation, national legislation, race breakdowns and outside topics like gentrification and national health trends. Through this research I will be able to ascertain factors limiting the availability of nutritious foods to individuals living in various neighborhoods. The relationship between external factors and availability of nutritious food can be used to find other relationships between income, race and the occurrence of different public health issues such as obesity and diabetes. These issues are of pressing importance to public health today, and research that can assist in the augmentation of availability of nutritious foods can help mitigate these public health issues.

| Presenter: Fernando Villafuerte, Physics |
| Research Initiative for Scientific Enhancement (RISE) Program |
| Co-Authors: Paul Sideris, William West |
| Faculty Mentor: Steven Greenbaum |

**Powering Probes in Deep Space: An Investigation of Lithium Primary Batteries with Hybrid Carbon Polymonofluoride and Manganese Dioxide Cathodes Using Magic Angle Spinning Nuclear Magnetic Resonance Spectroscopy**

The bodies of the outer solar system potentially contain many clues to its origin, and of particular interest are moons like Europa, which is believed to harbor an ocean beneath its icy crust. In order to investigate such distant locations, we must design means of powering probes capable of functioning at great distances from the earth, and primary batteries are a leading candidate. The Hunter College Solid State Nuclear Magnetic Resonance (NMR) Laboratory, in conjunction with the Jet Propulsion Laboratory (JPL), is investigating primary battery chemistries that employ metallic lithium (Li) anodes and hybrid carbon polymonofluoride (CFx) and manganese dioxide (MnO2) cathodes. Li-CFx batteries have among the highest theoretical energy densities, but their power output is relatively limited. Li-MnO2 batteries cannot store as much energy, but have better power output. By mixing CFx and MnO2, we hope to balance the storage potential of CFx with the rate capability of MnO2. We employ magic angle spinning (MAS) NMR to understand the discharge mechanism in Li-CFx/MnO2 batteries. As the battery discharges, Li+ ions migrate to the cathode and react with either CFx or MnO2. We harvest hybrid cathodes from batteries discharged to 70%, 50%, and 20% state of charge, and analyze them with MAS NMR to identify where and when in the discharge cycle the Li+ ions react primarily with CFx or MnO2. This information will assist in the validation of the measurements made on our battery chemistries at JPL, and potentially allow us to optimize the fabrication of CFx/MnO2 cathodes.

| Presenter: Clark Gentile, Psychology |
| Undergraduate Research Fellowship; Macaulay Honors College |
| Co-Authors: Danelly Rodriguez, Natalia Macynioka, Jannatun Ferdowski, Regina Miranda |
| Faculty Mentor: Regina Miranda |

**Induced Optimism to Change Depression-Related Cognitions**

One cognitive characteristic of depression is depressive predictive certainty, the tendency to predict with absolute certainty that negative events will happen and that positive events will not happen in
one’s future. Previous research suggests that one way to shift depressive predictive certainty is through an induced optimism paradigm. The current study extends previous research by introducing better control conditions and focuses on individuals high in depressive symptoms. Individuals high in depressive symptoms were shown sentences of positive or negative future events that were highly or moderately likely or unlikely to happen and asked to answer whether the situation presented was likely to happen to them (experimental) or whether the sentence was written in blue ink (control). Events were configured so that positive events had a higher likelihood of occurrence than negative events. We hypothesize that positive future-oriented mental rehearsal will decrease depressive predictive certainty and negative mood. If results support our hypotheses, the findings could be applied to treatments for depressed patients in order to decrease depressive symptoms.

**Your Age is Showing: Determining the Age of Young Brown Dwarfs**

Brown dwarfs are substellar astronomical objects that form like stars, but that are not massive enough to fuse hydrogen the way stars do. Brown dwarfs continuously cool, fade, and shrink over billions of years, but maintain the same mass. Changes in radius and temperature affect the brown dwarf’s spectrum (a breakdown of how much light at each wavelength we collect with our telescope), which we can then analyze to determine its age. In order to determine the ages of 11 potentially young brown dwarfs, we have reduced their high-resolution near-infrared (1.1-1.4μm) spectra collected using the Keck II telescope in Hawaii. Using this data, we calculated their radial velocities (how quickly the brown dwarf is moving toward or away from us) and combined those values with previously known kinematic information in an attempt to group them with stars of the same age, known as nearby young moving groups. We successfully placed three of them, thus assigning those three well constrained ages. We also compared spectra from our 11 brown dwarfs to spectra of established young (<500 million years old) and field age (1-5 billion years) brown dwarfs in order to evaluate the consistency of spectral indicators of youth across age, resolution, and wavelength regime.

**Oedipus the King—Knowingness and Humanity**

Human reason is pitted against divine interpretation and obedience in the play Oedipus the King. The trait of knowingness displayed by Oedipus is his tragic flaw. My discussion of this tragedy will be in conversation with the article, “Knowingness and Abandonment: An Oedipus for Our Time,” by Jonathan Lear. While Lear primarily deals with Oedipus’ knowingness as a defense mechanism, I will deal with it as a mark of his humanity. Our conclusions are not mutually exclusive; they naturally entail one another. It is Oedipus’ human love for both his Theban and Corinthian family that ultimately leads to his painful end. Because of his fear of harming his loved ones, Oedipus sacrifices everything he knows and everyone he loves. He sacrifices the chance to be with his parents as they grew older. He gives up his family to save them. While that may be seen as a sacrilege or a flaw of knowingness, that desire is very human. Thus, the tragedy of Oedipus is a comment on our common humanity as we struggle to negotiate with our general helplessness in this world.
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<th>The Utilization of Mental Health Facilities amongst Ethnic and Racial Minority College Students</th>
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<tr>
<td>Text</td>
<td>The purpose of this study is to understand racial and ethnic differences in mental health care utilization in college students. The hypotheses of this study are that Hispanic and Black students will be less likely to seek out treatment for mental health problems than White students. In addition, the study hypothesizes that Black and Hispanic students are less likely to seek out and use mental health care because of issues related to racism, including fears of discrimination, a lack of trust in medical providers, and cultural stigmas. This is a paper survey study that is administered only once per participant. Participants are Hunter College students who are 18-65 years of age. Participants are recruited in-person on the Hunter College Campus in hallways or in the library. Participants are spoken to individually so as to maintain participant privacy. The study concluded that one, discrimination in general or discrimination from health care provider/therapist does impact mental health care utilization. Two, this discrimination also impacts trust and it's possible that discrimination affects racial disparities in utilization via interpersonal trust and motives/reasons. Finally, there do seem to be different social norms in Black and White communities regarding mental health treatment.</td>
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| Presenter | Betsy Hernandez, Physics and Mathematics |
| Co-Author | Suvi Gezari |
| Faculty Mentor | Kelle Cruz |

| Title | Statistical Analysis of Quasar Light Curves |
| Text | We present a statistical analysis of galaxies with active central black holes, known as quasars, in the Pan-STARRS1 Medium Deep Survey (PS1 MDS). PS1 MDS obtained images for galaxies in 10 small patches of sky over the course of 4 years, starting in May 2010. During the times of the year where the quasars were observable, the MDS patches of sky were examined at 5 wavelengths. We extracted the light curves of 670 quasars that were selected using a color-color diagram. From this quasar sample, we selected 104 quasars whose variability was at least two standard deviations higher than the variability of the PS1 star sample. We performed a statistical analysis of the light curves of the selected quasar in four optical wavelength bands. We used a maximum probability method to find the best-fit parameters in a model shown to successfully describe the variability of optical quasar light curves known as the Damped Random Walk (DRW) model. The DRW parameters tested were variability amplitude, sigma, and characteristic timescale, tau, while incorporating the Zoghbi et al. 2013 method for light curves composed of inconsistent observations. We found the frequency distribution of maximum probability parameters distributions were similar to a previous study conducted by Kelly et al. 2009, where a Bayesian analysis was performed on an independent quasar sample. |

| Presenter | Jan van der Swaagh, Special Honors Major |
| Faculty Mentor | Elidor Mehilli |

| Title | Politics and Music in Postwar Soviet Union |
| Text | In 1948, the Soviet state censored the Composers Union, singling out six composers for being “formalist.” They were reprimanded by fellow composers and Andrei Zhdanov, the head of Soviet ideology over the course of a three-day congress and an official statement released by the state. This censorship is one of the most notorious events in music during the 20th century. I want to examine this event through one of the victims who is lesser known, Vissarion Shebalin. This is for two reasons. First, most of the literature on this incident focuses on two other more famous composers censored during this incident: Dmitri Shostakovich and Sergei Prokofiev. Second, most of the literature treats this event only musically. As a contrast, I believe that looking at it through Shebalin reveals a different perspective: this censorship was motivated by politics and not by any musical problems. |
I start by examining speeches offered during the congress and the statement issued by Andrei Zhdanov. By doing so, I reveal inconsistencies that undercut and delegitimize the charge of formalism. Next, I look at Shebalin’s String Quartet No. 5 “The Slavic.” Despite the fact that the piece is treated as a formalist work, I show that it not only does not fit into the Soviet definition of formalism, but it, in many ways, follows the guidelines of acceptable music. Finally, I compare this event to the targeting of political leaders only a few years beforehand. Through this, I reinforce the political nature of this censorship.

| Presenter: Nicole Bogdan, Biochemistry  
Faculty Mentor: Hiroshi Matsui |
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<td>Identification and Characterization of Magnetic Exosomes in Magnetospirillum Magneticum</td>
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Exosomes are extracellular vesicles that contain intracellular cargo like RNA, DNA, and proteins. These exosomes have specific cell targets throughout the body, and can modify their behavior through horizontal transfer of materials. Recent studies have shown that exosomes shed by cancer cells promote metastasis in healthy cells. If cancer-derived exosomes can be labelled with superparamagnetic iron oxide nanoparticles, the path of metastasis non-invasively can be tracked through MR imaging. We propose utilizing the characteristics of exosomes released from Magnetospirillum magneticum, a bacteria that synthesizes its own superparamagnetic magnetite crystals. Previously, magnetosomes, 100-200 nm magnetite crystals produced inside the bacteria, have been isolated from M. magneticum. However little research has been done on its other shedding exosomes. In this study, we found that the bacteria indeed releases exosomes that contain RNAs, DNAs, proteins, and iron oxide nanoparticles. These magnetic exosomes can be applied for real time imaging of metastasis pathways. |

| Presenter: Kevin Park, Asian American Studies  
Co-Author: Linda Luu  
Faculty Mentor: Jennifer Hayashida |
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<td>Students Who Care Too Much: How Students Fight Historical and Institutional Amnesia Through College Activism</td>
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By focusing on the concept of Asian American Studies at the undergraduate level as an entryway for Asian American activists and scholars into the field, this presentation seeks to discuss the historical relationship between AAS and community organizing as well as compare current struggles within AAS. How has undergraduate engagement continued to act as a gateway for Asian Americans to come into their own processes of critical thinking, racialization and politicization? The presentation hopes to reimagine the current role of AAS at the undergraduate level to better connect the community to the classroom. In addition, in light of the many new digital media platforms, how has the role of the classroom changed in relation to AAS? Through which alternative points of entry are youth arriving at Asian America outside of the classroom? The presenters will discuss how they each arrived at Asian American Studies, came into their own racialization process and how undergraduate AAS has informed their research and organizing work. The presentation also hopes to discuss the significance of new ways youth are becoming engaged in Critical Ethnic Studies and how community organizing can also become a point of departure into AAS. In addition, we will discuss the ways we have shown care for each other through organizing, whether it be through the bonds and relationships that develop from these groups, or through the combatting of the hegemony of white- and eurocentric curricula. We would also like to discuss ways in which we can develop and sustain collective memory around our organizing efforts, both to sustain our work to transform institutions and also to sustain ourselves as student scholars, organizers, and artists. |

| Presenter: Jean-paul Ventura, Physics & Earth Science  
AstroCom NYC Fellowship, Hunter Undergraduate Research Fellowship |
|---|
| Co-Authors: Aurora Cid, Sarah Schmidt, Kelle Cruz, Emily Rice  
Faculty Mentor: Kelle Cruz |
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<td><strong>Investigating the Spectroscopic Variability of Magnetically Active M-Dwarf Stars.</strong></td>
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<td>Magnetic activity, a wide range of observable phenomena produced in the outer atmospheres of stars, is currently not well understood for M dwarfs. In higher mass stars, magnetic activity is powered by a dynamo process involving the differential rotation of a star's inner regions. This process generates a magnetic field, heats up regions in the atmosphere, and produces emission line radiation (H-alpha) from collisional excitation. This emission signature is revealed in the stars' electromagnetic spectrum. Using spectroscopic data from the Sloan Digital Sky Survey (SDSS), we compare the H-alpha radiation emission strengths for a sample of 12,000 known brightness-variable M dwarfs with those of a known non-variable sample. This is done in order to examine if they're changes in brightness correlate with the intensity of their magnetic fields.</td>
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| Presenter: **Linda Luu**, Sociology  
Macaulay Honors College  
Faculty Mentor: Erica Chito Childs |
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<td>This project interrogates notions of the &quot;good&quot; family and the &quot;good&quot; parent as constructed in relation to logics of the nation, empire, and citizenship. I situate the immigrant family within discourses of responsible parenting to study how state violence affects the ability of immigrant families to resemble normative kinship structures and how the failure of immigrant families to perform normative ideals of familial love is viewed by the state and civil society. Methods: I analyze case studies including legal cases resulting in the separation of Mexican American families, Donald Trump's remarks towards the Khan family during the 2016 Presidential election, and the backlash to Amy Chua's memoir Battle Hymn of the Tiger Mother-in order to understand the family in relation to the nation-state and U.S. empire. Results: In each of the cases, international geopolitics structured feelings about the immigrant family. Furthermore, these feelings were routed through affective notions of familial love and responsible caregiving. Lack of proficiency in language was cited as a lack of commitment to ones child and cultural traditions were seen as oppressive and a foreign attack on American values and norms. Conclusions: The immigrant family is seen as a threat to the nation and the traditional family unit and xenophobic sentiment is coded in depoliticized terms of familial love, responsibility, and care. I argue that we must look at affective language and the ways in which love is racialized in order to understand the nation, empire, and citizenship in its current formations.</td>
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### Poster Presentation Abstracts

**Wednesday, April 5th, 2017**  
**Poster Session #1**  
**9:45am - 11:45am**

| 1 | **Presenter:** Karen Ebenezer, *Biology and Classics*  
Thomas Hunter Honors Program, McNulty Scholars Program, Yalow Scholars Program, Bluhm Scholars Program  
**Co-Authors:** Joey Verdi, Jayne Raper  
**Faculty Mentor:** Jayne Raper  
**Assessing the Presence of Functional Trypanosome Lytic Factors in Human Breast Milk**  

Breast milk is the primary source of nutrition for newborns, containing a range of cholesterol, nutrients, and innate immune factors that protect infants from infection. Human milk hosts a range of immune factors, such as active complement proteins and maternally transferred IgA2 antibodies, but also has significant lipid character. High-density lipoproteins (HDL) complexes circulate in plasma, and transport cholesterol and lipid throughout the human body. These complexes are characterized by the presence of the structural cholesterol acceptor protein apolipoprotein A-1 (APOA1). Recently human breast milk proteome analyses have indicated the presence of APOA1. However, the relative amount of HDL in breast milk remains unclear and its presence has not been validated by conventional biochemistry. Additionally, our innate immune system is fortified by a specific subset of high-density lipoproteins, called trypanosome lytic factors (TLFs), named for their ability to kill an infective unicellular parasite called the African trypanosome. These TLFs contain two unique proteins in addition to APOAI: Haptoglobin-related protein (HPR) and apolipoprotein L-1 (APOL1), the latter of which induces the cellular death of a trypanosome through pore formation. Till now, APOL1 has not been detected in any human breast milk proteome analyses, despite the known presence of APOA1. Using various purification procedures and biochemical assays, we investigated whether TLF complexes were present in human breast milk, whether it possessed a detectable degree of functional APOL1, and whether the presence of these innate immune factors can confer potential physiological benefits to neonatal immune systems. |

| 2 | **Presenter:** Lenura Ziyadinova, *Biochemistry*  
McNulty Scholars Program, Yalow Scholars Program, Thomas Hunter Honors Program  
**Faculty Mentor:** Nancy L. Greenbaum  
**Identifying the Structure of the U12-U6 snRNAatac Complex of the Minor Spliceosome of Human and Arabidopsis using Homonuclear NMR Spectroscopy**  

Pre-mRNA splicing is an important process in the preparation of messenger (m)RNA prior to the translation of the mRNA message into protein. Pre-mRNA splicing involves excision of noncoding introns and the joining of flanking coding exons, catalyzed by the spliceosome, a complex consisting of small nuclear (sn)RNAs and many proteins. The catalytic core of the major spliceosome consists of the U2 and U6 snRNA, and that of a low abundance (minor) variant spliceosome uses the U12 and U6atac snRNA complex. In this study, we are investigating the structure of U12-U6atac snRNA complex of minor human and plant Arabidopsis spliceosomes by homonuclear NMR spectroscopy. We have used Total Correlation Spectroscopy (TOCSY) and nuclear Overhauser enhancement spectroscopy (NOESY) two-dimensional NMR experiments for analysis of U12-U6atac snRNA samples. TOCSY experiments look at the spin coupling through bonds and NOESY experiments look at the through-space interactions between nuclear spins. The NMR data collected for Arabidopsis U12-U6atac snRNA complex revealed 4 A-U base pairs, 7 G-C base pairs, and at least one G-U base pair. The data also confirmed presence of the catalytic triad in both complexes. In the future, we will attempt to identify the base pairing patterns of human U12-U6atac snRNA complex using NMR analysis. Identification of the structural features of the U12-U6atac snRNA complex will help us better understand assembly of the minor class of spliceosomes to form its RNA
catalytic core. Comparison of structural features of the two spliceosome varieties will help us construct
types of spliceosome assembly and activity.

### Effects of Plant Extracts P2, Ppe280ac, Ppe28a on Metastatic Prostate Cancer Cells

Mortality from cancer is due primarily to metastatic spread. In the majority of cancer patients, the primary
tumor is unlikely to kill whereas the metastatic disease will result in mortality. Unfortunately, current
treatments for metastatic cancers such as prostate cancer are largely ineffective. Using in vitro models,
our laboratory is testing the effect of novel compounds extracted from Hawaiian plants on the
proliferation of metastatic prostate cancer cells. Specifically, we have three compounds: P2, Ppe280ac
and Ppe28a. Using the 4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium (MTT) cell proliferation assay, we
tested the effect of P2, Ppe280AC and Ppe28A on three metastatic prostate cancer cell lines: MDA
PCA2b, E006AA-hT and PC3. While PPE 280AC had no effect on MDA PCA2b cell proliferation, P2 and
PPE28A both decreased cell proliferation of E006AA-hT and PC3 cell lines. Our results suggest these
compounds have different efficacy in decreasing cell proliferation and that each cell line has a different
response to these compounds. Taken together, our results suggest that these compounds may have

### Environmental Mold, Weight Gain, and Spatial Deficits

People working or living in moldy buildings have cognitive deficits, including attention, perception, and
memory problems. Our laboratory examined how mold exposure could cause such problems by
investigating mice's responses to toxic and non-toxic mold exposure. Animals were split into three
treatment groups: 1) control mice (VEH), 2) mice given non-toxic, extracted Stachybotrys chartarum spore
skeletons (NTOX), and 3) mice given intact toxic Stachybotrys chartarum spores (TOX). Mold-exposed mice
showed significant memory deficits on several learning tasks, including Morris water maze (MWM). We
were interested in this spatial learning task, because some mold-exposed people have difficulty finding
their way to familiar locations. The combined mold groups (NTOX+TOX) showed significant spatial
memory deficits and increased anxiety. Interestingly, NTOX mice were more vulnerable to these
behavioral changes than TOX mice. In previous experiments, the responses of mice to mold were related
to body weight. Therefore we examined the relationship between weight and MWM performance. For VEH
mice, heavier mice performed more successfully during the MWM task. However, this relationship was
not seen in the two mold-treated groups. In these groups, increased weight gain in the days leading up to
the test were correlated with better MWM performance. In other words, mice that were better able to
continue to gain weight when exposed to mold, performed better. It should be emphasized that all mice
in this experiment were within normal weight limits; the heavier mice were not overweight.

### Triggered Disassembly of Viral Capsid Nanocontainers Under Physiological Conditions Using An Inverse
Electron-Demand Diels-Alder (IEDDA) Reaction

5

Presenter: Nicolette Somogyi, Biology
McNulty Scholars Program, Thomas Hunter Honors, Hunter Undergraduate Research Fellowship
Co-Authors: Patrick Kelly, Mandé Holford
Faculty Mentor: Mandé Holford

Triggered Disassembly of Viral Capsid Nanocontainers Under Physiological Conditions Using An Inverse
Electron-Demand Diels-Alder (IEDDA) Reaction
Neuroactive peptides derived from the venom of aquatic snails have tremendous therapeutic potential, especially for the treatment of neurological disorders and pain. However, the poor pharmacokinetic profile of these agents has thus far limited their clinical application. One strategy to address this shortcoming is to package the peptide of interest into a nanocontainer designed to protect it during transit and release it at the molecular target. While loading and transport of an arbitrary peptide into a nanocontainer derived from the protein capsid of the P22 bacteriophage has been demonstrated, controlled disassembly under physiological conditions remains a challenge. This research project investigated the potential of targeted bio-orthogonal click chemistry to induce disassembly of the P22-derived nanocontainers. Our general strategy was to use the Inverse Electron-Demand Diels Alder (IEDDA) reaction to conjugate a tetrazine-bearing peptide to a site-specific norbornene moiety on the surface of the P22 capsid, thus mimicking an insertion mutation associated with capsid instability. More specifically, a proof-of-concept study was conducted by conjugating two small synthetic peptides under physiological conditions via the IEDDA reaction. These peptides were made using solid-phase peptide synthesis (SPPS), and were subsequently modified with activated tetrazine- and norbornene-carboxylic acid groups, respectively. Tetrazine- and norbornene-bearing peptides, as well as any putative dipeptide conjugation products, were characterized via High Performance Liquid Chromatography, mass spectrometry and gel electrophoresis.

6
Presenter: Avelyn Mae Delos Reyes, Chemistry-Biochemistry
McNulty Scholars Program, Yalow Scholars Program
Co-Authors: Patricia Gonzalez, David R. Mootoo, N. V. S. Dinesh K. Bhupathiraju, Michael Drain
Faculty Mentor: David Mootoo

**Synthesis and Biological Characterizations of Porphyrin-Glucoside Conjugates**

Photodynamic therapy (PDT) is a method for treating a variety of diseases, including cancer, age-related macular degeneration, rosacea and acne. In PDT a photosensitizing agent is administered, and the patient is then irradiated. This leads to production of reactive oxygen species (ROS) that can cause cell death. The development of PDT agents continues to be a very active area of research because of its less invasive approach, affordability compared to other treatments, and short recovery time. However, a drawback of this therapy is systemic toxicity, which results because the photosensitizer may distribute to both diseased and healthy tissue. In this context, porphyrins, which are the prototypical sensitizers for PDT, have been conjugated to sugars in order to target specific cell types. Cancer cells have an increased uptake of glucose. Therefore, cancer cells will have elevated consumption of porphyrin-glucoside conjugates. These porphyrin-glucoside conjugates show promise as PDT agents against cancer. In this project, novel conjugates of tetraperfluorophenylporphyrin (TPPF) and glucose in which a thio-substituted alkyl glucoside is linked to the porphyrin, were prepared. Key reactions in this synthesis were an alkene cross metathesis for the synthesis of the sugar segment, and a nucleophilic substitution on TPPF. The syntheses and characterization of these TPPF-glucose conjugates, and their photophysical and biological properties, will be presented.

7
Presenter: Christina Helmi, Bioinformatics
McNulty Scholars Program, Yalow Scholars Program
Faculty Mentor: Carmen V. Melendez-Vasquez

**Functions and Mechanisms of Autophagy and ER Stress during Brain Development**

Autophagy is a lysosome-dependent catabolic mechanism that plays an important neuroprotective function. It is responsible for the degradation and recycling of worn-out cytoplasmic proteins and organelles. Autophagy protects against endoplasmic reticulum (ER) stress, which takes place after trauma to the central nervous system (CNS). Previous research has shown that autophagy may have both beneficial and deleterious effects on neuronal cells; however, its mechanism(s) remains unknown. Furthermore, there is a correlation between the disruption of autophagy and the induction of ER stress. ER stress can also either activate or inhibit autophagy. We hypothesize that the protein markers of autophagy increase during development to maintain the homeostasis of neuronal cells. The goal of this
research is to identify the changes in protein expressions in brain tissues during normal development in rat brains through the use of western blots and interaction proteomics. J Imaging and PRISM are the two programs that are used to analyze and quantify the data. Attaining a clear understanding of the mechanisms of autophagy and ER stress is critical for the prevention and perhaps the treatment of various neurodegenerative disorders such as Parkinson’s and Alzheimer’s diseases.

8 Presenter: Promie Faruque, Biological Sciences
McNulty Scholars Program, Yawal Scholars Program, Thomas Hunter Honors College
Co-Authors: Elyssa Bernfeld, David Foster
Faculty Mentor: David Foster

mTOR Activation in Response to Glutamine

The mammalian target of rapamycin (mTOR), when activated, promotes cell cycle progression and cell proliferation. Glutamine, an amino acid that is often required by cancer cells to promote cell proliferation and survival, can stimulate mTOR either through a glutamine-leucine amino acid transporter or through the activation of Rag GTPases by glutaminolysis. Given that our lab has previously shown that mTOR activation by other nutrients requires phosphatidic acid (PA) derived from phospholipase D (PLD), we hypothesize that PLD-generated PA is also required for mTOR to be activated by glutamine. Our experiments were conducted to determine the mechanism of glutamine sensing by mTOR through PLD and the mechanism of activation of PLD by glutamine. Using the K-Ras driven breast cancer cell line, MDA-MB-231, which are known to have elevated PLD activity, we studied the extent to which cells need PLD for glutamine stimulation, the effects of glutamine deprivation on PLD activity, and the mechanism of glutamine sensing by PLD. Our data show that PLD activity is dependent on glutamine, and activation of mTOR through glutamine is dependent on PLD activity. Further, glutamine deprivation results in a decrease in PLD activity. Glutamine was found to be able to activate PLD and mTOR in the absence of leucine, giving a new mechanism of action. Further studies regarding the mechanism of leucine-independent glutamine sensing for mTOR activation and the mechanisms of exploiting the glutamine-PLD pathway to control cell cycle progression and cell proliferation are warranted.

9 Presenter: Daniela Mikhaylov, Biology and Music
McNulty Scholars Program, Macaulay Honors College
Co-Authors: Limor Cohen, David Foster
Faculty Mentor: David Foster

Olive-Oil Derived Oleocanthal Induces Cancer Cell Death

Oleocanthal (OC) is a compound found in Extra Virgin Olive Oil (EVOO) and was shown to be more toxic to cancerous cells than non-cancerous cells. My project specifically looks into the mechanism of OC's toxicity. Due to the observed morphology and kinetics of cell death upon OC treatment, we hypothesized that OC leads to lysosomal membrane permeabilization, which in turn activates necrotic and apoptotic death pathways. We first looked at the kinetics of OC's effect on prostate and breast cancer cells, and discovered that even a short exposure to OC is highly toxic to the cells. We further showed that ATP levels gradually decreased immediately following OC treatment, which is a consequence of necrosis. It is known that during necrosis, death channels in the plasma membrane open, which can be inhibited using glycine. We found that glycine partially rescued OC-induced cell death. Lysosomal membrane permeabilization (LMP) is known to cause apoptosis and necrosis. Therefore, we collected the lysosome-free cytosolic fractions and then used western blot to show that upon treatment with OC, certain lysosomal cathepsins leak into the cytosol. This suggests that OC treatment leads to compromised stability of the lysosomes. In conclusion, the kinetics of cell death, gradual decrease in ATP levels, and presence of lysosomal proteins in the cytosol all indicate a mode of death consistent with LMP.

10 Presenter: Norine Chan, Psychology-Behavioral Neuroscience
McNulty Scholars Program, Macaulay Honors College
Faculty Mentor: James Gordon
**An Electrophysiological Examination of Sex Differences in Visuospatial Processing**

Sexual dimorphisms in spatial vision are attributed to effects of gonadal sex steroids during neonatal development. Androgens protect against apoptosis in the male brain, contributing to sex-specific asymmetries in the primary visual cortex. Effects of cortical asymmetries on visuospatial processing were investigated using electroencephalogram (EEG) recordings. Amplitudes and signal-to-noise ratios of electrophysiological recordings were examined as measures of excitatory brain mechanisms in response to visual stimuli. Horizontal striped patterns were presented at a contrast reversal rate of 7.50 Hz and progressively increased in number and fineness. During a single run, spatial frequency of the gratings was varied in six discrete steps, ranging from 0.8 to 24 cycles/degree at a 114 cm viewing distance and 1.6 to 48 cycles/degree at a 228 cm viewing distance. A Fourier analysis was used to extract visual evoked potentials (VEPs) and examine the dominant (second harmonic) component of the response. Females exhibited significantly higher response amplitudes at each spatial frequency than males. Females also demonstrated larger signal-to-noise ratios at lower spatial frequencies, while males showed larger ratios at higher frequencies. These recorded sex differences are consistent with the differential hemisphere involvement females display when completing spatial tasks and the heightened sensitivity to high-frequency patterns seen in males. Although females demonstrate stronger VEP responses, the data indicate their visual cortex exhibits a greater amount of noise when interpreting spatial patterns. This suggests a neuroanatomical effect on electrophysiological response that could significantly impact our understanding of how spatial vision differentially manifests between males and females.

**The Neurophysiological Basis for the Importance of Borders in Human Color Perception**

From an evolutionary perspective, color vision was a necessary development in the evolution of life as it allowed organisms to be capable of recognizing critical objects within their environments. In this study, we examined the neural mechanisms underlying human color perception. Multi-channeled chromatic visual evoked potentials (cVEPs) were recorded in response to colored stimuli for a range of saturations to observe the human cortical response to color patterns. We examined the responses to a patterned (checkerboard) stimulus and a non-patterned, full-field, chromatic stimulus. The outer edges for all stimuli were blurred. The responses were the largest over the primary visual cortex. The cVEP data was indicative of the existence of non-linear mechanisms over the range of the stimulus saturations that was used. We were able to determine that whereas the latency for the non-patterned stimulus did not shift, the latency for the patterned stimulus decreased with an increase in the chromaticity of the stimulus. For both types of stimuli, the peak magnitude increased with an increase in the chromaticity. However, even though the patterned stimulus had half of the amount of total color, it displayed a significantly greater peak response. This demonstrates the significance of borders in the physiological mechanisms underlying human color perception. Our future research will focus on delineating more thoroughly the relationship between sensation and psychophysiology.

**Determining Ecological Drivers of Venom Variation in Terebrids**

Terebrids are predatory marine snails that utilize a venom cocktail of naturally occurring bioactive toxins to subdue their prey. This project characterizes diet and venom variation in terebrids using metabarcoding methodology and Next Generation Sequencing (NGS). Venom variation, previously studied
in a sister clade of cone snails, has been shown to be dependent on environmental pressures and diets, rather than phylogenetic relations. Identifying the drivers of terebrid venom variation is important in understanding its evolution. The working hypothesis for this project was that, similar to cone snails, terebrid venom variation is linked to its predatory diet. The worm diet of terebrids was deciphered using metabarcoding methodology, which is a biodiversity assessment technique that applies universal polymerase chain reaction (PCR) primers to mass-amplify DNA barcodes from a collection of specimens. PCR products were analyzed using NGS to identify the gut contents of terebrids. Specifically, DNA was extracted from the gut of 16 terebrid specimens who were chosen to represent a diversity of terebrid phylogenetic clades. The DNA was then amplified using COI and 16s primes designed to amplify polychaetes and other worms in the terebrid diet. Preliminary results indicate that it is possible to amplify the gut contents of terebrids. The methods employed in this project pave a route for future genetic analyses targeted towards determining additional drivers of intraspecific variation. This is the first study to molecularly identify the terebrid vermivore diet and correlate it to terebrid venom variation.

Presenter: **Marie Mazzeo, Biochemistry**  
McNulty Scholars Program, Macaulay Honors College  
Co-Authors: Michael Murphy, Frida Kleiman  
Faculty Mentor: Frida Kleiman

**Cellular Functions of an Alternatively Polyadenylated mRNA Isoform of RNA Polymerase II**

Mammalian cells that are subject to DNA damage undergo a coordinated and dynamic response to regulate cellular functions after stress. One mechanism to control cellular conditions during the DNA damage response (DDR) is the regulation of transcription termination at alternative polyadenylation sites, followed by the addition of a poly(A) tail to the mRNA. This mechanism is termed “alternative polyadenylation” (APA). RNAP II is a 220 kDa enzyme that transcribes DNA into messenger RNA (mRNA), and it has been shown that under DNA damaging conditions, the RNAP II transcript undergoes APA at a polyadenylation site in the first intron. However, the precise function of the intronic APA isoform of the RNAP II gene is unknown. We expect to show that this intronic APA isoform does not translate into protein. We anticipate that this RNAP II isoform will possess functional implications for the cellular response to DNA damage, regardless of whether or not a novel protein is expressed. Furthermore, this will provide a greater insight of the mechanism by which RNAP II functions.

Presenter: **Ridwan Carim-Sanni, Biochemistry**  
MARC Program  
Faculty Mentor: James Gordon

**Investigating Sexual Dimorphisms in the Contrast Sensitivity of ON/OFF Pathways in Human Visual Cortex**

The presence of Hormones such as testosterone during prenatal development have been shown to result in the variation of neuronal composition in the cortex of males and females. It is important to understand how these physiological variations affect the mechanisms that underline proper functioning of the visual system. Visual patterns that can be used to isolate and study underlying mechanisms involved in the perception of different characteristics of light (such as luminance, color and contrast) across the human population can be used to investigate these variations.

In this project, we recorded the visual evoked potentials (VEPs) elicited by Isolated bright (ON-pathway) and dark (OFF-pathway) check patterns and investigated the sexual dimorphism within the magnocellular cells that has been known to be responsible for the perception of contrast within the visual system. We studied 111 participants, 52 males and 59 females, within the ages of 18-40. The electrical activity of the brain was recorded and signal averaged to yield VEPs. Consistent with earlier studies, we found greater response in both males and females to dark check patterns than to bright check patterns. Our results also show that overall females have greater responses and are more sensitive to contrast compared to males. Furthermore, Females have greater signal to noise ratios compared to males. These results suggest that the sexual dimorphism in neural structure directly affects underlying perceptual mechanisms in human visual cortex.
African Trypanosomes are protozoan parasites that cause sleeping sickness in primates and mammals. A subfraction of high density lipoproteins (HDL or good cholesterol), found in select primates, termed Trypanosome lytic factor (TLF) provides innate immunity from the species Trypanosoma brucei brucei. The parasites take up TLF by receptor-mediated endocytosis, allowing Apolipoprotein L-1 (APOL-1), a protein component of TLF, to insert into the endosomal membrane and form a pore upon recycling to the plasma membrane. This pore disrupts osmotic balance within the parasite, resulting in water influx and eventual lysis. It has been shown that the pore formed by APOL-1 is cation selective, depends on acidic pH for insertion into a lipid membrane, and subsequent neutralization of pH for opening of the pore. However, the protein's structure, mechanism of insertion, and pore formation are unknown. Our hypothesis is that there are two pore-forming domains and one transmembrane domain in APOL1. This study outlines a preliminary investigation of APOL-1 structure via computational methods. Using several servers to predict secondary structure and topology, such as TOPCONS, PHYRE2, and PSIPRED, we were able to create a consensus model of secondary structure and transmembrane domains. We also identified several template candidates for tertiary structure modeling, based on homology or fold recognition. In the future, we will test pore-forming domains identified computationally through in-vitro methods, such as residue substitution. We hope to use these models to elucidate the mechanism of parasitic membrane interaction of APOL-1, such as conformational changes dependent on pH and potential oligomerization.
surface of certain tumors. Therefore, tumor specific diagnostics and therapeutics may be possible by conjugating appropriately modified mannose derivatives to known imaging and anti-tumor agents. In this context, the overall goal of this research is to evaluate how modifications of the 3-O-carbamoyl mannose scaffold may impact on tumor binding. To this end 4-pentenyl glycosides of mannose with different ring substituents were prepared. The synthesis of these materials, introduction of the 3-O-carbamoyl moiety and conjugation to fluorescent tags will be presented.

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<th>Presenter: Oluwatoni Sonubi, Psychology MARC Program Co-Authors: Alaina Schneider, Herman Pontzer, Nesha Burghardt Faculty Mentor: Nesha Burghardt</th>
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<td>Reduced Immune Investment and Alterations in the Circadian Rhythm with Energy Stress: Evidence from a Mouse Model</td>
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During periods of energy stress, organisms must allocate limited resources to some tasks at the expense of others. Prioritization of energy among competing organ systems during growth in humans and other mammals is understudied. Here, we examine the effects of food restriction and physical activity on organ growth in mice. We placed 32 adolescent female mice (129/SvEv) into four conditions (n=8 each): activity-based anorexia, ABA (high activity, food restriction); food restricted, FR (low activity, food restriction); wheel control, WC (high activity, high food availability); and home cage, HC (low activity, high food availability). Mice spent 10 days in their randomly assigned condition, during which we measured body weight, food intake, water intake, and running wheel activity. Mice were then euthanized and organs were weighed. Food restricted mice (ABA and FR) ate less food, drank less water, and weighed less than non-food restricted mice (HC and WH). Food restricted mice (ABA and FR) also exhibited reductions in liver, heart, and kidney mass, relative to non-food restricted mice (HC and WH). Spleen size was reduced more than other organs, indicating resource allocation away from immune function and prioritization of other systems. Lastly, running wheel activity was shifted to a different time of day in ABA mice compared to WH mice, suggestive of effects on the circadian rhythm. These results indicate that food restriction may compromise the functioning of the immune system and combining food restriction with access to a running wheel may induce changes in circuits responsible for maintaining the circadian rhythm.

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<tr>
<th>Presenter: Anila Thomas, Psychology-Behavioral Neuroscience Macaulay Honors College Co-Authors: Mimi Phan, David Vicario, Jake Aronowitz, Carolyn Pytte Faculty Mentor: Cheryl Harding</th>
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<td>The Effect of Auditory Experience on the Lateralization of Neurogenesis</td>
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Until the 1980s, the scientific community believed that new neurons could not be added to the adult brain. Now adult neurogenesis is widely accepted and implicated in the ability to learn and remember. Adult neurogenesis is common in the animal kingdom, occurring in limited brain regions, encoding memories important for the species. Songbirds have become important model organisms to study new neuron incorporation. In zebra finches, neurogenesis occurs in brain regions, involved in memorizing and producing songs, including the caudomedial nidopallium (NCM). Analogous to the mammalian auditory cortex, NCM processes complex auditory stimuli. NCM shows a preference for conspecific over heterospecific songs or pure tones. Greater neurogenesis in the left NCM was associated with better memory for previously-heard songs. Neural activity in NCM is also lateralized—the right NCM is more responsive to birdsong than the left. Yang & Vicario (2015) found that exposing zebra finches to heterospecific instead of conspecific songs reversed NCM’s lateralization of responsiveness. Understanding how environmental stimuli affect lateralization of the number and responsiveness of new neurons is vital to understanding brain function. The present pilot study investigated whether exposing zebra finches to heterospecific(canary) rather than conspecific(zebra finch) songs affected neurogenesis in NCM. Heterospecific songs did not affect the distribution of new neurons in NCM differently from...
conspecific songs. Given the small sample size and methodological differences between this and the Yang & Vicario (2015) study, more research is necessary to understand how different auditory stimuli affect the lateralization of neurogenesis in the NCM.

**20**

**Presenter:** Nawrin Chowdhury, Environmental Studies  
**Faculty Mentor:** Allan Frei

**Urban Beekeeping**

Urban beekeeping has been on the rise in major cities like NY. Honeybees that pollinate large scale agricultural crops have declined in unprecedented rates over the last decade in North America. This sudden disappearance of bees is called Colony Collapse Disorder (CCD). This phenomenon is caused by a multitude of factors such as stress, diseases like Varroa, changes in beekeeping practices, malnutrition, loss of habitat etc. Most of these factors can be attributed to larger scale agricultural practices. Approximately 30% of crops are pollinated by bees, and with a dwindling bee population, food production can be adversely impacted. My research will involve understanding the facets of urban beekeeping as well as answering some major questions. These questions are: What are the benefits and drawbacks to urban beekeeping? What are some prevalent diseases among bees and how can they be prevented? Can beekeeping in urban areas potentially help mitigate CCD? How does urban beekeeping affect the ecology of NYC? Are cities a more suitable environment for bees and beekeeping? I will be working with Liane Newton of nycbeekeeping.org as well as conducting interviews with urban beekeepers to potentially answer these questions.

**21**

**Presenter:** Julian Zhao, Psychology  
**Hunter Honors Program**  
**Co-Authors:** Tyrel Starks, Jeffery Parsons  
**Faculty Mentor:** Tyrel Starks

**Resilience as a Buffer Against Depression in Gay and Bisexual Men Who Experience Childhood Sexual Trauma and Intimacy Partner Violence**

Gay and bisexual men (GBM) and other men who have sex with men experience depression at rates higher than their heterosexual counterparts. Multiple risk factors for depression have been identified, and among these are two specific forms of interpersonal violence: childhood sexual trauma (CSA) and intimate partner violence (IPV). Not all GBM who experience these forms of interpersonal violence experience serious impairment; yet little are understood about the importance of resilience in this population. The purpose of the current study was to test interactions among CSA, IPV, and resilience in the prediction of depression. Data was used from 339 GBM in relationships (Mage = 35.8; SD = 11.6) who completed survey questions on CSA and IPV (Conflict Tactics Scale) as well as self-report measures of resilience (Stress-Related Growth) and depression (Brief Symptom Inventory). A multiple regression analysis was conducted (controlling for age, race/ethnicity, income and HIV status) to test the significance of the three-way interaction among CSA, IPV and resilience as well as all two-way interactions. The three way interaction was significant (B = -1.45 β = -.26; p = .001). Both the main effect of CSA and IPV were significant, indicating that men who reported these experiences also reported higher rates of depression. In contrast, resilience was significantly and negatively associated with depression only among those who reported both CSA and IPV. These results suggest that resilience may serve as a buffer against depression among GBM who have experienced multiple forms of interpersonal violence.
Research on Critical Discussions of Race, Equity, and Justice in Teacher Education

This literature review summarizes research on the inclusion and acknowledgement of race and equity in teacher education. The fear and hesitation to discuss issues of racial justice is associated with feelings of guilt, anger, shame, or sorrow. However, the authors theorize that without these discussions teachers contribute to negative outcomes such as opportunity gaps, overrepresentation of students of color in special education classes, and underrepresentation of these students in gifted classes. Even though many people are taught color blindness and aspire for race to be a problem of the past, when we ignore these issues it just reinforces racial hierarchies. Research suggests color cognizance and having discussions of race and equity with educators is critical and lacking. Knowledge as a power tool to assist educators overcome challenges and benefits associated with teaching diverse students. Acknowledging and celebrating differences helps students feel, welcomed and understood this allows a student to reach their full potential because they know they have the support they need to succeed. This paper summarizes research on making race explicit in the classroom and makes recommendations for future directions.

How IRE-like Structure in a-syn and APP Function as Post-Transcriptional Regulator

Metal interactions with riboregulators in eukaryotic mRNAs have a function in cytoplasmic protein synthesis and metal sensitive quadruplexes that have been shown to function as protein synthesis rate regulators in human mRNA. There is an interest in a-synuclein and amyloid precursor protein because both proteins play a role in neurodegenerative diseases; specifically, a-synuclein plays a role in Parkinson's disease while APP plays a role in Alzheimer's disease. Learning more about how metal ions interact with these eukaryotic RNA may give us more insight into the pathogenesis of these neurodegenerative diseases. The CAGUG loop in IRE-RNA is similar to the CAGAG loop in APP and identical to the CAGUG loop in a-synuclein, so it is expected that regulation by metabolic iron binding to APP-RNA and a-syn-RNA will act as a genetic regulatory mechanism in eukaryotes that balances inhibitor and activator protein interactions, just like how iron binding to IRE-RNA was a genetic regulatory mechanism. After eIF4G and both RNAs were synthesized, the binding of a-syn RNA and APP-RNA to eIF4G was assessed through protein quenching. The purified protein was in the cuvette while increasing concentrations of RNA was added. The measurements gave a curve and the KD values were derived from the curve. Since there was a change in quenching for both APP and a-syn RNA, it can be concluded that these two RNAs interact with eIF4G. Additional protein quenching experiments need to be performed in order to further assess the meaning of these interactions.

Translating Political Commitment to Action: WHO, AMR, and the One Health Approach

Antimicrobial resistance (AMR) is an urgent global concern, extending beyond the human and animal health sectors. Rendering previously treatable conditions fatal, AMR has the potential to severely hinder attainment of Sustainable Development Goals (SDGs) adopted by the 70th UN General Assembly, particularly those concerning maternal and child health, universal health coverage, poverty, and food security. Due to misuse of antibiotics for human illnesses, as growth promoters and medicine in
livestock, and poor hygiene practices in medical facilities inter alia, drugs against malaria, tuberculosis and others are becoming increasingly ineffective. If action is not taken, an estimated 10 million people will die annually due to AMR in 2050. The World Health Organization (WHO) was established in 1948 to ensure the highest possible level of physical, mental, and social health by all peoples. At the request of the World Health Assembly, WHO, with the World Organization for Animal Health (OIE) and the Food and Agriculture Organization (FAO) (tripartite), developed a Global Action Plan (GAP) adopted in 2015 to ensure successful treatment and prevention of infectious diseases by using a One Health multisectoral approach. Following adoption of the GAP in 2015, member states have been urged to have in place national action plans on AMR by 2017. High-level meetings at the UN on AMR and preparation of reports were supported, and analysis on publicly available materials on AMR, guidelines established by the tripartite, and actions taken by the international community were investigated to assess the progress made in preventing the progression of AMR.

Wednesday, April 5th, 2017
Poster Session #2
1:45pm–3:45pm

25 Presenter: Rishi Ravichandran, Biology
Co-Authors: Livia Bayer, Diana Bratu
Faculty Mentor: Diana Bratu

The role of Nup154 in oskar mRNA translational regulation during Drosophila melanogaster oogenesis

In Drosophila melanogaster, the spatial and temporal expression of mRNAs plays a crucial role in oocyte and early embryonic development. The expression of several maternal mRNAs is tightly regulated. One of these mRNAs, oskar, localizes in the oocyte, and is necessary for oogenesis progression, germ cell development, and embryonic body patterning. During transport into the oocyte, the mRNA remains translationally repressed, until it becomes anchored to the posterior cortex where it is de-repressed, enabling translation. oskar mRNA repression is critical for proper axis specification in the zygote, as premature Oskar protein expression causes a bicaudal embryonic phenotype. Cup is a protein that plays a major role in the translational repression of oskar mRNA. It also physically and genetically interacts with a nuclear protein Nup154, which is a component of the nuclear pore complex (NPC). This complex is essential for gametogenesis, correct microfilament dynamics, and viability in Drosophila oogenesis. The goal of my project is to determine Nup154’s role in oskar mRNA translational regulation by looking at premature Oskar protein expression in Nup154 knockdown. Simultaneously, we visualize the expression and localization of Cup and other proteins, as well as their association with oskar mRNA, in the absence of Nup154. Visualizing premature expression of Oskar protein will strengthen our hypothesis that Nup154 plays a role in oskar mRNA translational regulation.

26 Presenter: Stephanie Albarracin, Physics
Research Initiative for Scientific Enhancement Program, Hunter Undergraduate Research Fellowship
Co-Authors: Stephen Munoz, Steven Greenbaum
Faculty Mentor: Steven Greenbaum

NMR Spectroscopy of a Non-Polyether Solvent-Free Polymer Electrolyte

Technology has rapidly integrated itself into daily life, causing an increased demand in better battery performance. Since the commercialization of lithium-ion batteries in 1991, there has been minimal modification of the Li-ion battery model. Massachusetts-based company, Ionic Materials, LLC has developed a novel polymer with promising transport properties that has the potential to revolutionize the battery world. Uniquely, the non-flammable polymer functions as both the electrolyte and separator in a thin solid state all the while remaining electrochemically stable against Li metal. Our lab uses NMR Spectroscopy techniques to identify the properties that aid in the material’s favorable qualities. In particular, we measure the self-diffusion coefficients of both the Li+ ions and anions at varying
temperatures. These measurements are directly related to the electrical (ionic) conductivity and hence the electrochemical performance of the electrolyte. We report here Li+ self-diffusion coefficients on the order of 10^{-9} m^2/s, much higher than any previously reported Li self-diffusion in a solid at room temperature. These results are extremely favorable for battery application, and we believe that this, along with the mechanical advantages of the material, could represent a transformative property leading to more than double the energy storage capacity of present day lithium ion batteries without the current safety issues that plague the present state-of-practice.

**27** Presenter: **Alkaya Massaly**, Chemistry Research Initiative for Scientific Enhancement Program Co-Authors: Wayne Harding, Alyson Clarke, Shahrar Ahmed, Satish Gadhiya Faculty Mentor: Wayne Harding

**Synthesis of Tetrahydroisoquinoline/D3 Antagonist Hybrids as Potential Anti-Cocaine Agents**

Selective dopamine (DA) D3 receptor antagonists have demonstrated the potential to diminish drug seeking behavior.[1] However, no selective D3 antagonists are clinically available at this time due to poor pharmacodynamics, pharmacokinetic properties or toxicity of the compounds studied. New chemical scaffolds for D3 ligands are needed in our quest for useful pharmacotherapies to treat addiction disorders. The tetrahydroisoquinoline (THIQ) motif is present in a number of ligands that target central nervous system (CNS) receptors.[2] However, THIQ-containing compounds have not been studied extensively as D3 receptor ligands. Five compounds were prepared, starting from commercially available 6,7-dimethoxytetrahydrosioquinoline in three linear steps. The steps in our reaction sequence include SN2 pathway mechanisms and triazole formation. A separate reaction pathway was attempted with the use of 1-Bromo-4-Chlorobutane, an alkyl halide, coupled with THIQ. Compounds were purified by flash column chromatography and were characterized by 1H NMR, 13C NMR and mass spectroscopy. The novel ligands will be evaluated for affinity to DA D1, D2 and D3 receptors. Our work will provide insights into structural features of the scaffold that impact D3 receptor affinity and selectivity and pave the way for the identification of biological tools and drug leads of relevance to addiction medication development.

**28** Presenter: **Qin Lin**, Psychology Psychology Honors Co-Authors: Samantha Denefrio, Tracy Dennis-Tiwary Faculty Mentor: Tracy Dennis-Tiwary

**Optimizing Attention Bias Modification Training (ABMT): The Role of Engagement and Anxiety Ligands**

Anxiety is associated with an attentional bias toward threatening information in the environment. This anxiety-related threat bias (TB) is commonly measured using the reaction time-based dot probe task that tracks the speed of responding to cues replacing either a neutral or threatening facial expression. A simple modification of the dot probe task, termed Attention Bias Modification Training (ABMT), is a promising treatment for anxiety. However, recent inconsistencies and null findings in ABMT studies have highlighted the role of individual differences in ABMT. One such individual difference is engagement, or a person's level of interest in and motivation to complete a specific task. In the present study, anxiety and positive and negative affect were assessed to examine their impact on engagement, then TB was measured at three timepoints: arrival, following a brief stressor, and again following one session of ABMT in a large college-aged sample (N = 109). Self-reported engagement was assessed following each TB assessment and post-ABMT to test the hypotheses that 1) less anxiety would predict increased engagement and that 2) increased engagement would predict better ABMT efficacy. The findings implicate the importance of boosting engagement in order to optimize ABMT efficacy, and the potential impact of mood on engagement even in a non-anxious sample. Future research should focus on developing methods aimed at improving mood and engagement in order to bolster ABMT efficacy.

**29** Presenter: **Eric Lau**, Biology Macaulay Honors College, Hunter Undergraduate Research Fellowship
Faculty Mentor: Derrick Brazill

**Role of Bifunctional Protein DdFARAT in Cell Metabolism**

The proliferation of cancer is a widespread cause of death and is associated with defective intracellular signaling. Inositol phospholipids are critical in eukaryotic cellular communication by regulating membrane conformation and serving as a platform for protein receptor activity. Dictyostelium discoideum serves as a model organism to study this due to its simple developmental cycle and numerous signaling pathways shared with mammals. More importantly, Dictyostelium has been shown to use a similar ether-linked inositol phospholipid during chemotaxis (Clark et al.). While the phospholipid molecules used by each organism are different in nature, both display similar evolutionarily conserved roles. One protein complex necessary for ether lipid synthesis is the fatty acyl reductase-acyltransferase (FARAT) complex, which consists of a fatty acyl reductase (FAR) domain, and a Dihydroxyacetonephosphate acyltransferase (DAT) domain. To better understand its impact on cell communication, the FARAT complex’s role in Dictyostelium was assessed by profiling the growth curve, chemotaxis, and developmental morphology in wild type cells, and cells either lacking or overexpressing the protein complex. Initial growth curve data showed FARAT deletion mutants are developmentally compromised, and have an extended lag phase when cultures are started from an extended stationary phase. Both of these phenotypes can be partially rescued by expressing portions of the protein complex, FAR or DAT. These preliminary results suggest that the FARAT protein complex may be vital to intracellular signaling in Dictyostelium and of equal importance in mammalian cells. The FARAT complex potentially serves as a therapeutic target for cancer treatment.

**Microtubule Modifying Drugs Improves Peripheral Nervous System Myelination**

The myelin sheath is a membrane that surrounds neuronal axons, facilitating the transmission of nerve impulses. In the peripheral nervous system (PNS), the specialized type of glial cell that insulates nerve axons is known as a schwann cell (SC). When there is loss of myelin, not only is the kinetics of conduction hindered, but also the survival of nerves; such as the case in Guillain-Barré syndrome. Although the exact details of cellular myelination remain elusive, our lab has shown that the cytoskeleton plays an important role in myelination processes. Microtubules (MT), a component of the cytoskeleton, have been shown to go through intracellular changes during SC development and play an important role in myelin protein trafficking and process outgrowth. Our goal is to further understand how post translational modifications in MTs affects SC cell development and myelination. To do so, we used a MT-modifying drug that inhibits the removal of the amino acid tyrosine from α-tubulin (detyrosination) and observed that the drug treatment increased the amount of myelin segments in SC-DRG co-cultures, while also promoting myelin protein expression in mature SCs. This gives insight to the complicated role that both dynamic and stable MTs play in the development of SCs.

**The Impact of Restrictive Voting Laws on Minority Voter Turnout**

The United States is a nation that was founded on democracy and liberal egalitarianism; Americans value the idea that all voices are heard equally, without discrimination based on class, race, gender or any other factor. Why is it then, if we truly are a nation founded on equality and democracy, that our state laws result in a significant portion of age-eligible citizens not voting? The United States has a longstanding history of employing discriminatory voter suppression tactics to hinder minority groups from equitably accessing the ballot. In Mecklenburg County, Charlotte, 70% of African-Americans used early
voting to cast their ballot, as opposed to 48% of their white counterparts; in the 2012 presidential election, election boards voted to cut 238 hours of early voting in the district. Across the country, states have implemented restrictive voter ID laws, which have a disparate impact on turnout of minority voters. More than 16 million American registered voters lack an acceptable form of identification. Across the states that do require a form of ID, direct costs of attaining a driver's license range from $14.50 to $58.50. This proposal will examine the disparate impact that restrictive voter laws have on turnout of minority voters of color. In addition, it will examine voting laws nationally in conjunction with voter turnout of black and Latino voters and how these data trends relate to states which have a history of voter suppression tactics.

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<th>Presenter: Dayanni Bhagwandin, Chemistry Yalow Scholars Program, MARC Scholars Program Co-Authors: Patricia Gonzales, David Mootoo Faculty Mentor: David Mootoo</th>
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| **Synthesis of Sugar Containing Cytotoxic Agents for Tumor Targeting**

Current cancer treatments are problematic because of systemic toxicity. Therefore, there is a need for tumor selective drugs. Such drugs may be prepared by modifying a cytotoxic molecule so that it can target a receptor that is specific to tumor cells. For example, annonaceous acetogenins (AA) are a class of potent cytotoxic agents that target a broad range of tumor cell lines, but are also toxic to normal cells. Altering these structures so that they resemble carbohydrates could increase their affinity to carbohydrate receptors that are overexpressed on certain tumors. The goal of this project is to synthesize carbohydrate analogues of 4-deoxyannomontacin (4-DAN), 4-deoxyannomontacin (4-DAN) was selected because of the relatively simple chemistry required for its synthesis. The structure includes a cyclic ether core with a hydrocarbon chain attached to a butenolide via a hydrophobic spacer. Substitution of the cyclic ether core with ribose or mannose could increase selectivity and cellular uptake in tumor cells. Key steps in this synthesis involve the preparation of O-allyl glycosides of ribose and mannose in which the primary alcohol is converted to O-alkyl ethers with different chain lengths. These allyl glycosides are used in cross metathesis (CM) reactions with a butenolide alkene partner to give a CM product, which is transformed to the desired sugar analogues. The synthesis of the O-allyl glycoside precursors will be presented.

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<tr>
<th>Presenter: Shrisha Maskey, Biochemistry Hunter Undergraduate Research Fellowship Co-Authors: Stephanie Yakoubovitch, Huong Chu Faculty Mentor: Nancy L. Greenbaum</th>
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| **Analysis of Conformational Changes of the Yeast Spliceosomal U2-U6 snRNA Complex upon Binding to Protein Cwc2 Using Fster Resonance Energy Transfer**

The splicing of precursor messenger (pre-m)RNA involves the removal of non-coding regions (introns) and ligation of coding regions (exons). This process is catalyzed by the spliceosome, a large and dynamic ribonucleoprotein (RNP) complex comprising five small nuclear (sn)RNAs and hundreds of proteins. Of the five snRNAs, U2 and U6 are highly conserved and integral parts in the catalytic core of the spliceosome. Evidence suggests that the RNA complex needs to undergo conformational change to become active and to perform the splicing reaction. Proteins such as Cwc2 are suggested to play an essential role in inducing the active conformation of the spliceosome by interacting with U6 internal step loop (ISL) and intron near the 5’ splice site. We are studying the three-dimensional structure of the yeast (y)U2-U6 complex, and the effect of Cwc2 to its folding, using Fluorescence Resonance Energy Transfer (FRET). This technique allows a wide range of distances (10-350 Å) between multiple points in a complex, and changes in those distances, to be measured in solution. Preliminary data from electrophoretic mobility shift assay (EMSA) suggests specific interaction between Cwc2 and the yU2-U6 snRNA complex. Previous work from our laboratory suggests that the human U2-U6 snRNA complex becomes more compact upon binding to RBM22, the human homologue of Cwc2. Understanding the activation of the
U2-U6 snRNA complex is important in understanding the dynamic processes of spliceosome assembly and mechanism.

34 Presenter: Anjelica Gangaram, Biochemistry
Hunter Undergraduate Research Fellowship
Co-Authors: Joanna Ciavarella, William Perea, Nancy Greenbaum
Faculty Mentor: Nancy L. Greenbaum

The Interaction of the Protein RBM22 to the Human Spliceosomal U2-U6 and U12-U6atac snRNA Complexes

The removal of introns, intervening sequences, from precursor messenger RNA molecules, and the ligation of flanking coding exons, is an important step in the maturation of mRNA prior to translation of the message into a protein. This RNA splicing is catalyzed by the spliceosome, a large, dynamic complex found in a cell’s nucleus comprising five small nuclear (sn)RNAs and over 100 protein components. There are two types of spliceosomes, the major (99.7% of spliceosomes) and the minor (~0.3%). The catalytic core of each spliceosome is formed by two snRNAs, U2 and U6 snRNAs for the major spliceosome, U12 and U6atac for the minor variant. Numerous proteins have key roles in the assembly and activation of the RNA catalytic core, most of which are used in both the major and minor spliceosomes. The goal of this research is to determine how the protein RBM22 contributes to folding of the human (h)U2-U6 and (h)U12-U6atac complexes into catalytically active conformations. An interaction between RBM22 and U6 snRNA was identified by others, using electrophoretic mobility shift assays (EMSA). We have expressed RBM22, transcribed RNA representing the U2-U6 and U12-U6atac snRNA complexes, and have shown by EMSA that RBM22 binds to U2-U6 and, for the first time, to U12-U6atac snRNA complexes as well as to U6 snRNA alone. Preliminary EMSA measurements suggest that RBM22 binds specifically to the U12-U6atac snRNA with a dissociation constant of 8.4 +/- 0.7 μM. Further characterization of RBM22’s role will be pursued by fluorescence and solution NMR spectroscopy.

35 Presenter: Jessica Johnson, Physics
MARC Program
Co-Authors: Sunita Humagain
Faculty Mentor: Steve Greenbaum

EPR Studies on Irradiation Damage and Healing of Kapton

Kapton is a polymer used in spacecraft’s surface for its superior thermal stability, mechanical durability, radiation resistance and electrical insulation. However, severe radiation exposure in space flight damages and compromises Kapton’s properties. Ionizing radiation produces radicals that consequently make it more electrically conductive, and changes its mechanical and optical properties. We are therefore motivated to identify mechanisms for healing after radiation. We compared the healing times of irradiated Kapton kept in three separate environments: air, argon, and vacuum. Radiation treatment was performed by our colleagues at the Kirtland Air Force Base in New Mexico. We used Electron Paramagnetic Resonance (EPR) to measure the concentration of radicals as a direct measure of radiation damage. The vacuum-sealed sample showed no healing. We observed a decreasing concentration of radicals from samples separately exposed to air and argon, with the air sample healing most quickly. We believe the presence of oxygen in air allows trapping and recombination processes that account for the faster healing time. These measurements demonstrate that caution must be used in interpreting laboratory results on irradiated Kapton, where exposure to air may have occurred (Plis, E., et.al. Effect of Atmosphere on Recovery Dynamics of Polyimide Film Damaged by Electron Radiation (Assurance Technology Corporation, USA)).

36 Presenter: Catherine Ubri, Psychology
BP-ENDURE Program
Co-Authors: Gaspar Cruz, Aliza Panjwani, Tracey Revenson
Faculty Mentor: Tracey Revenson
Examining Intolerance of Uncertainty in Health Domains: The Process of Conducting a Systematic Review

Intolerance of uncertainty (IU) is a dispositional factor, referring to difficulty tolerating uncertain future events and, subsequently, reacting negatively on behavioral, cognitive and emotional levels (Buhr & Dugas, 2005). Studies have examined IU as trans-diagnostic factor related to anxiety and mood disorders. Recently, IU has gained traction in studies among people in medical settings or with health conditions. The current systematic review will synthesize literature on the relationship between IU and adjustment to an illness, health concern or pre-condition. A literature search was conducted using MEDLINE, EMBASE, and PSYCINFO databases, for years 1994 to 2016. The Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) guided the review. Eligibility criteria were: 1) peer-reviewed, original, empirical research; 2) included human adults; and 3) measured IU in a health domain (e.g., chronic illness, health behavior change). Studies were excluded if they examined IU in relation to psychopathology only without the presence of a health condition or context. As will be shown in a flow chart, the initial search resulted in 2,089 articles; 659 duplicates were removed. After applying the inclusion/exclusion criteria to the 1,430 remaining articles, 65 articles were retained for the systematic review. Those articles are being coded (90% completed) for variables such as population, health domain, and relationship between UI and anxiety. Results will provide an overview of where and how IU has been studied with illness populations, specifically in relation to health conditions in which ones health may be uncertain.

37 Presenter: Syeda Nasim, Physics, Mathematics
AstroCom NYC
Co-Authors: Erin Kara
Faculty Mentor: Kelle Cruz

Measuring and Comparing Time Delay in Black Holes

Under the guidance of Dr. Erin Kara, I was privileged with the opportunity to view and work with newly obtained observational data captured by the XMM-Newton space telescopes, which for the duration of approximately one month focused its gaze on a super-massive black hole centered at the spiral galaxy IRAS13224-3809. During this project Dr. Kara guided me through the complex code designed to analyze the raw data from these observations, and extract information relevant to our focus study on time delay. I executed some of this code for each individual observation in order to obtain graphs, and to extract relevant information for comparative analysis. We then averaged the data from all of the observations so that we could better compare the time delay in our black hole to that of other black holes from former studies.

38 Presenter: Rabab Shaddoud, Biological Sciences-Behavioral Neurobiology
Thomas Hunter Honors Program
Co-Authors: Jordi Mاغrane
Faculty Mentor: Carmen V. Melendez-Vasquez

Investigating the Role of Schwann Cell Mitochondrial and Cellular Dysfunction in Friedreich’s Ataxia Pathology

Mitochondrial abnormalities often play a role in the pathology of a number of neurodegenerative diseases. Our research focuses on Friedreich’s Ataxia (FA), a mitochondrial genetic disorder that includes sensory loss, progressive limb and gait ataxia, and weakness. We study the peripheral neuropathy occurring in FA, which affects both sensory neurons and myelin. Despite being critical for peripheral nervous system myelination, there is limited evidence on Schwann cells’ mitochondrial or cellular dysfunction and their role in Friedreich’s Ataxia pathology. We isolate and culture Schwann cells from the FA mouse model KIKO (Knock in/Knock out), and compare them to the wild type (WTWT) mice (healthy counterparts to the KIKO model). We use antibodies to label Schwann cell specific markers and mitochondria, and with the aid of confocal microscopy we aim to compare mitochondrial...
length/fragmentation and density between the KIKO and the WTWT mice. These studies are important since differences in Schwann cells between mouse models may shed light on the role that mitochondrial dysfunction plays in the progression of the disease. This project will allow us to begin to investigate how Schwann cell abnormalities may impact myelination of axons in the peripheral nervous system in link to the disease.

### Electrical Conductivity of Self-Assembling Tripeptides

Oligopeptides, and tripeptides in particular have traditionally been an understudied area of biochemistry. Many recent studies, however, have proven a remarkable propensity of these oligopeptides to aggregate into self-assembling nanostructures. The properties and potential of these nanostructures (8000 tripeptides are possible) are likely myriad, although thorough research into their potentially groundbreaking abilities is only in its earliest stages. The aim of this project is to investigate the potential electrical conductivity and electrochemical properties of certain suitable self-assembling tripeptides with significant amino acid group aromatic overlap. Although the project is in its early stages, we hope that, depending on the yields, nanostructures with such abilities may prove themselves useful in the fields of photonics, electrochemistry, and medicine as well as the emerging fields of nanotechnological engineering and advanced molecular filtration.

### LIM Protein Ajuba’s Involvement in ATR Signaling by Direct Interaction With RPA

Genome stability is essential for cell survival. The ATR pathway is a DNA damage response pathway that is activated by UV radiation or replication stress caused by Hydroxyurea. Replication protein A (RPA) is a heterotrimeric complex essential for DNA replication, recombination and repair. The ATR pathway is activated by the accumulation of RPA to single stranded DNA. Our lab has shown that the LIM protein Ajuba associates with RPA to prevent the ATR response. We hypothesize that LIM protein, Ajuba, directly interacts with the OB folds of RPA to repress the ATR pathway. Through in vitro analysis of Ajuba-RPA interaction we have probed the interaction amongst the RPA complex subunits by co-immunoprecipitation, and their co-localization by immunofluorescence. The results suggest that the RPA complex, specifically RPA70, directly interacts with Ajuba to prevent ATR activation. As other labs have shown Ajubas overexpression with head and neck cancers, our results may lead to a better understanding of cellular transformation. The underlying role that Ajuba plays in ATR is likely involved in the control of apoptosis. We speculate that Ajuba plays a role in the ATR pathway as a negative regulator through direct interaction with RPA 70.

### An Insight into the Expression, Purification and Folding of a Synthetic Collagen-Mimetic Protein

Collagen is the most abundant protein in the human body. For collagen to function normally, it must fold properly into its native conformation of a triple helix along with maintaining a repeating Gly-X-Y sequence throughout each chain, where X and Y represent usually proline and hydroxyproline, respectively. If collagen misfolds or has a mutation in the sequence, then catastrophic consequences can ensue. Investigating collagen-mimetic proteins can shed light on characteristics of native collagen. 877 Trix- is one of such proteins that will be investigated. This protein, which is expressed from an artificial gene in
E. coli, is an improved design of a previous expression construct which has the collagen-mimetic peptide fused to a His thioredoxin (Trix) tag. Thioredoxin was eliminated in this novel 877 Trix expression construct due to the costliness, and the lengthy and ineffective process associated with the eventual removal of Trix tag using thrombin digestion. The His tag is maintained in 877 Trix, which allows the protein to be purified effectively. The concerns of eliminating Thioredoxin is the precipitation of expressed protein. However, our experiments found 877 present mainly in soluble form. In this study, the expression of 877 Trix will be optimized with respect to IPTG concentration for induction, temperature of growth, and host cells. The ultimate goal is to have high level of expression of 877 Trix in soluble form, which can also be purified with a simplified procedure. 877 Trix is expected to fold into a triple helical structure, which is crucial for protein function and thus, purification and expression must be optimal.

**Mapping the Prefrontal Cortex-Basal Forebrain-Amygdala Circuit**

A comprehensive understanding of circuit connectivity between structures that partake in aversive learning and memory is crucial for developing targeted treatments for anxiety disorders. Much work has described strong reciprocal connections between the prefrontal cortex and the amygdala, as well as the basal forebrain and the amygdala. Direct projections from the prelimbic portion (PL) of the prefrontal cortex to the amygdala are functionally important during discrimination of safety. However, the PL may influence amygdala activity during fear discrimination indirectly, via its projections to the basal forebrain. Basal forebrain inputs to the amygdala are thought to underlie stimulus salience and attentional processing. Thus, the PL could encode threat in the amygdala indirectly, via the basal forebrain. To investigate this possibility, we are using retrograde and anterograde tracing methods to map out PL projections to cells in the basal forebrain that project to the amygdala. To determine the functional significance of this circuit, we are combining tracing with immunohistochemistry for the immediate early gene c-fos. After mice are exposed to recall of aversive stimuli, we identify the active subpopulations of cells in the basal forebrain as well as their input and output structures. Given the important role of the prefrontal cortex in anxiety disorders, unveiling these connections is crucial to understanding how the prefrontal cortex contributes to amygdala activity via direct and indirect routes.

**The Effects of Curcumin in the Lateral Amygdala, Infralimbic Cortex and Fear Memory in Chronically Stressed Rats**

Exposure to chronic stress can have contrasting effects on the morphology and physiology of different memory-related regions of the brain, such as the lateral amygdala (LA) and infralimbic cortex (IL). Previous studies have shown long-lasting dendritic hypertrophy and increased spine density in LA neurons of chronically stressed rats. Our lab has also shown that chronic stress, as modeled by a chronic oral corticosterone paradigm, persistently enhances the expression of synaptically-localized proteins within the LA of rats. Furthermore, we found that these CORT-induced synaptic effects in the LA are prevented if rats are fed a curcumin-enriched diet during oral CORT exposure. Other studies have shown that chronic restraint stress can also lead to dendritic atrophy and reduce spine density in the IL of rats, but whether these morphological changes persist beyond a period of chronic stress and whether it alters IL-dependent memories, such as fear extinction, is not well known. We aim to determine if chronic stress is associated with synaptic remodeling in the LA and IL by restraining male Wistar rats for 10 days. We are also investigating whether a curcumin-enriched diet can prevent this stress-induced morphological remodeling and prevent the modulation of aspects of fear memories known to depend on the LA and IL.
Secondary indicators of stress show that chronically stressed rats gained significantly less weight compared to controls during stress exposure. Furthermore, we show that chronically stressed rats exhibit trends towards enhanced acquisition of a Pavlovian fear memory that is prevented if fed a curcumin-enriched diet.

44  Presenter: Mohamed Elhawary, Biochemistry  
Thomas Hunter Honors Program  
Co-Authors: Justin Fang, Kristina Fabijanic, Tori Yuen, Sham Rampersaud  
Faculty Mentor: Hiroshi Matsui

The Shape Dependency of Iron Oxide Nano Cages on Linear Assembly and Relative Drug Uptake

A major challenge of drug delivery systems is to design an appropriate delivery vehicle that is capable of transporting therapeutic agents, i.e. drugs, to specific organ sites. Iron Oxide Nano-Particles (IO-NPs) have been extensively studied for drug delivery because of their small size, ranging from 10-20nm, which is optimal for penetrating blood vessels and membranes. The overall shape of the IO-NPs, however, was not addressed previously in relation to its effect on neither the relative uptake of drugs, nor Nano-particle assembly. As opposed to the spherical, solid IO-Nano-particle that is cited throughout the literature, square, hollow Iron Oxide Nano Cages (IO-NCs) can be used as an alternative, and more efficient, drug delivery system. The size of the cavity can be controlled by varying the amount of iron added into the reaction. Since the hollow cavity of the IO-NCs is hydrophobic, it interacts favorably with many cancerous drugs. In addition, current studies have shown that IO-NCs is able to form linear chains by virtue of their square shape. The Nano-worm is only assembled when IO-NCs are used. Formation of IO-NCs is influenced primarily by concentrations of Oleic Acid to Oleylamine, which control the growth of the seed crystal. Also, temperature and treatment with sonication influences the overall shape of cages accordingly. The accrued benefits of the IO-NCs can only be showcased after successful synthesis of the square-shaped cages with a hollow interior.

45  Presenter: Bekhruz Bazarov, Medical Laboratory Sciences  
Hunter Undergraduate Research Fellowship  
Co-Authors: Mously Lo, Waleed Khalid, Rania Hatab  
Faculty Mentor: Chad Euler

Discovering Lymphocyte Markers for Diagnosing Children Predisposed to Rheumatic Fever

Streptococcus pyogenes is a Gram-positive bacterium that commonly causes strep-throat infection. The infection can be cleared from the patient’s body with the help of antibiotics such as amoxicillin or penicillin. However, if the strep throat infection is not treated adequately, autoimmune-complications may arise in susceptible individuals. One of these conditions is known as Rheumatic Fever (RF). RF is the leading cause of preventable cardiovascular disease in children worldwide, affecting >34 million people and leading to >345,000 deaths per year. In RF, the immune cells and antibodies in a patient, which were activated to stop S. pyogenes infection, cross-react with antigens in the patient’s body causing permanent damage to the heart. There are currently no clinical diagnostic tests available to determine the susceptibility of individuals, particularly children, to develop RF (estimated to be 3-6% of the world’s population). We are characterizing a previously derived mouse antibody against B-lymphocytes from RF patients. Our goal is to identify novel antigenic epitopes and derive new diagnostic markers for RF predisposition. Flow cytometry analysis has shown that our antibody can distinguish RF derived lymphocytes versus normal controls. Furthermore, western blot and mass spectrometry analysis of cell lysates from these lymphocytes have identified possible cytoskeletal structural proteins that cross-react with our potential RF diagnostic antibody. We anticipate that the further study of the expression of these antigens will help us gain a better understanding of the pathology of this disease.

46  Presenter: Gabriella Hetesy, Biochemistry  
Co-Authors: Joey Verdi, Russell Thomson  
Faculty Mentor: Jayne Raper
**Glycosylation-mediated Binding of IgM to Trypanosome Lytic Factors**

Trypanosomes are unicellular, flagellated parasites transmitted by tsetse flies, which cause Trypanosomiasis. However, humans and some primates are resistant to certain species, due to immunocomplexes called Trypanosome Lytic Factors (TLFs). The two known TLFs make up 1% of human high density lipoproteins (HDLs): TLF1 and TLF2. While the precise structural composition and size of the immunocomplexes are currently unclear, the known major proteins in both are the structural protein, Apolipoprotein A-1, and two key trypanolytic proteins. Haptoglobin-Related Protein (HPR) facilitates uptake of the immunocomplex by Trypanosomes, where Apolipoprotein L-1 (ApoL1) then forms cation-selective pores, eventually leading to osmolysis. The major difference is the additional IgM component of TLF2. In preliminary experiments, TLF2 was generated by incubating TLF1 with IgM from the same donor. Based on this data, we propose that both immunocomplexes are comprised of the same HDL complex and major proteins, and TLF1 and IgM form TLF2 in an equilibrium reaction. Due to IgM antibodies known affinity for carbohydrate antigens, we hypothesize that the antibody attaches to glycosylations on HPR in an equilibrium reaction. To test our hypotheses, we will attempt to shift the equilibrium towards TLF1 by incubating the immunocomplexes with carbohydrate-binding proteins called lectins, effectively reducing the availability of HPR for binding to IgM. Patients infected by trypanosomes are known produce higher amounts of IgM. Consistent with this model, we have observed a marked increase in TLF2 in trypanosomiasis patients during infection, as the excess IgM shifts the equilibrium.

**The Role of Armi in Regulating Oskar Expression in Drosophila Egg Chamber**

The Drosophila melanogaster homologue of MOV10, Armi, is an RNA helicase important for RNA interference (RNAi). Specifically, Armi is essential for formation of the RNA-induced Silencing Complex (RISC). The RNAi pathway works to silence retrotransposons from causing cell damage. Additionally, Armi is known to play a role in the proper localization of oskar, a maternal mRNA responsible for embryonic posterior determination. During mid-oogenesis (stages 7-8) oskar mRNA is localized to the oocyte’s posterior, and upon localization it is translated. Improper localization of oskar mRNA or its premature translation result in developmental defects. Previously, it was seen that in armi mutants oskar mRNA is prematurely translated and it fails to localize properly – oskar accumulates in the center of the oocyte. Processing bodies (P-bodies) are membrane-less organelles that are present throughout the egg chamber. Their constituent proteins suggest that P-bodies protect, degrade, and store mRNAs, such as oskar and bicoid. Oskar’s translational timing is in part regulated by P-bodies. It is not known if Armi resides within P-bodies, however, both MOV10 and the RISC complex are known to localize in P-bodies in mammals. I will address whether Armi plays a role in P-body formation and whether Armi resides within P-bodies. Preliminary results indicate that during stress, Armi-GFP, oskar, and bicoid particles are present within P-bodies and their localization is similar to wild type egg chamber. In armi knockdowns, bicoid is improperly localized, however, oskar mRNA is mislocalized. Interestingly, in the armi knockdowns, P-bodies still form, but appear morphologically different from wildtype P-bodies.

**The Effects of Chronic Social Defeat Stress on Learning-Induced Expression of Arc in the Amygdala**

Stress is known to induce depressive- and anxiety-like behavior in rodents. Previous work in our lab demonstrates that chronic social defeat stress also enhances the consolidation of a fear memory in mice. We have begun investigating the mechanisms underlying stress-induced increases in memory...
consolidation by testing the effects of social defeat stress on cell activity in the amygdala during fear learning. In these experiments, 129Sv/Ev mice experienced social defeat stress with an aggressive CD-1 mouse for 10 consecutive days. The day after the final social defeat session, defeated and control mice were tested in the social interaction test and fear conditioned six days later. On the day of fear conditioning, mice were exposed to 3 tones (20s, 2kHz, 70dB) that co-terminated with a foot shock (2s, 0.75mA) and were perfused ninety minutes later. Immunohistochemical procedures were then used to stain brain sections containing the amygdala for the immediate early gene Arc (activity-regulated cytoskeleton-associated protein). We found that stressed mice spent less time interacting with the CD-1 mouse than non-defeated control mice, consistent with the known effects of social defeat stress on social avoidance. Current experiments are underway to quantify behaviorally induced protein expression of Arc in the lateral amygdala, a brain region previously shown to play an important role in the formation of emotional memories. Our results will provide insight into whether chronic social defeat stress enhances memory consolidation by increasing Arc protein expression in the lateral amygdala during fear learning.

Thursday, April 6th, 2017
Poster Session #3
9:45am – 11:45am

49 Presenter: Mila Adelman, Biology & Psychology
Co-Authors: Stephanie Shih, William Gallagher, Heike Neumeister
Faculty Mentor: Thomas Preuss

Social Status Change Modulates Sensory Filtering in the African Cichlid Fish Astatotilapia burtoni

African cichlid fish Astatotilapia burtoni live in stratified social communities where males alternate between two social statuses: reproductively active, dominant (DOM) and reproductively dormant, subordinate status (SUB). These status changes make this species an excellent model for studying socially induced neuroplasticity. Here we examined the role of social status on the sensory filtering phenomenon called pre-pulse inhibition (PPI), a widely used operational measure of sensory evoked attenuation of startle behavior, which has been shown to be sensitive to the physical and emotional state of an organism (e.g., stress and anxiety). In A. burtoni communities SUBs are frequently bullied by DOMs. Such psychosocial stress has been shown to be a putative environmental modulator of PPI in rodents and fish. However, whether it is social status that drives such changes in PPI remains unclear. To address this question we measured startle rates in response to a PPI stimulus paradigm in SUBs and DOMs before and after social transition. The results show that PPI increased in SUBs ascending to DOM status as well as the reverse - a reduction in PPI for DOMs descending to SUB status. PPI remained unchanged in non-transitioning controls. Together the results support the notion that changes in social status can indeed drive PPI plasticity. Since PPI has been conceptually associated with the ability of an organism to maintain selective attention to its surroundings, our results might reflect an attentional shift in SUBs in order to avoid conflict and threats by DOM males.

50 Presenter: Danelly Rodriguez, Psychology
Research Initiative for Scientific Enhancement (RISE) program
Co-Authors: Clark Gentile
Faculty Mentor: Regina Miranda

Induced Optimism as a Mental Rehearsal to Decrease Depressive Predictive Certainty

Depressive predictive certainty develops through rumination about the future and has been found to be associated with symptoms of depression, anxiety, and suicidal ideation. The present study aims to test whether mental rehearsal of optimistic future-event predictions can decrease depressive predictive certainty and increase positive mood. Twenty-four participants high in depressive symptoms were randomly assigned into one of three groups. The experimental group (n = 9) was induced to practice
deciding that positive events would happen and negative events would not happen to them. Both of the control groups (n = 8, n = 7) performed a color-recognition task using the same stimuli in which they practiced deciding whether or not a phrase appeared in blue. Preliminary results suggest that practice in making optimistic future-event predictions increased optimism, slightly decreased depressive predictive certainty, and decreased negative mood. However, there was no change in positive mood. Additional data will provide statistical power to test the hypothesized effects.

Effects of Hawaiian Plant Extracts on Metastatic Prostate Cancer Cells

Prostate cancer (PCa) is the second leading cause of cancer related death among men in the U.S. Although cancer survival rates have improved over the years, treatments for metastatic cancers are still limited. Cancer metastasis is the major cause of cancer morbidity and mortality, and accounts for about 90% of cancer deaths. In fact, the relative 5-year survival rate for advanced stage PCa is about 28% and there are no current treatments that can cure metastatic PCa. In the present study, we evaluated the effects of novel compounds that have been extracted from Hawaiian plants on the viability of metastatic PCa cell lines. We tested the effect of PPE 28, PPE 28OAc, P2, BF1 1-1 BF1 1-2, BF1 1-3, BF1 1-7 and Red Algae Hexane on three metastatic PCa cell lines, MDA PCa 2b, E006AA-hT and PC3, using the 4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium (MTT) cell viability assay. Our current results suggest these compounds have varying efficacy in decreasing PCa cell viability. We observed about a 25% decrease in cell viability in E006AA-hT when treated with P2 and 35% decrease in MDA PCa 2b cell viability when treated with PPE 28OAc. These findings suggest that these novel plant extracts deserve further attention to investigate if they have a potential role in the therapy of metastatic PCa.

Investigation of the Basal Forebrain - Amygdala Circuit During Fear Recall

The amygdala is an integral structure for processing learning about threat and anxiety. Previous studies have shown that amygdala communication is synchronized via theta frequency (4-12 Hz) oscillations with the prefrontal cortex during discrimination of threat and safety. In particular, during safety, the prefrontal cortex activates inhibitory circuits in the amygdala, decreasing amygdala output and the behavioral manifestations of fear. It is not clear, however, which inputs amplify the prominent theta oscillation seen in the amygdala during fear and anxiety. One candidate structure is the substantia innominata/ventral pallidum (SI/VP) region of the basal forebrain. Cholinergic and inhibitory projections from the SI/VP to the amygdala have been characterized, but it is not well understood whether these inputs partake in encoding aversion in the amygdala. To address this question, we are using the immediate early gene cfos to identify the SI/VP cell populations that become active during recall of fear-conditioned stimuli. Furthermore, we are recording local field potentials in the SI/VP and the amygdala during conditioned fear recall. Together, these experiments will identify the dynamic patterns of SI/VP-amygdala communication and the SI/VP cell populations that become active during threat processing. This work contributes to our understanding of the fear learning mechanism by answering the question of whether there is a specific cell population in the basal forebrain that acts as an important input to the amygdala at the time of predictive threat.
A Phase 2 Study of the Dual mTOR Inhibitor MLN0128 in Patients with Metastatic Castration-Resistant Prostate Cancer (mCRPC)

Dysregulation of the PI3K/ATK/mTOR signaling pathways is one of the most common alterations found in prostate cancer patients. Both mammalian target of rapamycin complex (mTORC) 1 & 2 are downstream regulators in the PI3K pathway. Previous trials using rapalogs to inhibit mTORC1 have shown reactivation of AKT through feedback inhibition, possibly due to incomplete inhibition of mTOR. MLN0128 is a dual mTOR inhibitor that could overcome the resistance seen with rapalogs inhibiting mTORC1 in the past. In this phase 2 trial, we are interested in evaluating efficacy and toxicity of MLN0128 in mCRPC. We hypothesize that blocking the mTORCs may provide clinical benefit in mCRPC, with improved progression-free survival (PFS). We identified 9 patients age 52-79 with metastatic prostate cancer, castrate levels of testosterone (≤50ng/mL), and evidence of disease progression after prior treatment with abiraterone (ABI) and/or enzalutamide (ENZA). Primary endpoint was PFS at 6 months. Only 1 (11%) of 9 patients with mCRPC achieved 6 months of PFS under our phase 2 trial of MLN0128. Rising PSA on drug and declining PSA after discontinuing drug suggest that inhibition of PI3K pathway activities with our drug may lead to activation of androgen receptor (AR) signaling of prostate cancer cells, leading to disease progression. We have shifted our efforts to target this disease by focusing future clinical trials on inhibiting both mTORC1 & 2, and AR in hopes to use the interdependence of both mechanisms to delay disease progression.

Aging in Ferroelectric DKDP

Ultrasound generators and detectors, sensors, thermistors, light detectors, and tunable capacitors are just a few examples of modern-day devices utilizing the versatile properties of ferroelectrics. Analogous to ferromagnets, ferroelectrics are materials exhibiting a spontaneous polarization below a characteristic transition temperature. This polarization is reversible with the application of an external electric field. Ferroelectric materials also exhibit piezoelectricity and pyroelectricity, which are the temporary generations of electric fields induced by mechanical stress and thermal change, respectively. These features are what render ferroelectrics so crucial to our electronic and optoelectronic industries.

As a ferroelectric crystal with non-linear optical properties, deuterated potassium dihydrogen phosphate, or DKDP, is extensively used in contemporary lasers. Since we found that DKDP shared certain characteristics with disordered materials, our research aimed to determine the sources and probable effects of DKDP's disorder. We collected data on DKDP's dielectric behavior under differing thermal and electrical conditions, and employed polarized microscopy to image the domain structure of DKDP. Our research revealed that DKDP's disorder resulted from the diffusion of a minority population of hydrogen atoms within the material. Our data also shed light on how DKDP's disorder affected its energy landscape under constant conditions. This research provides contextual comparison with other disordered and atypical ferroelectrics; and the more we understand these materials, the more ably we can take advantage of their unique properties in technology.

Enriched environment housing stimulates hippocampal neuronal development and promotes defense against stress in rats

Dendritic spine density and morphology are determined by a variety of factors, namely stressors and enrichment. The current study seeks to explore the density and morphology of dendritic spines between
male rats raised in an enriched environment (EE) and those raised in single housing (SH) after being subjected to a single prolonged stress. It was hypothesized that there would be a greater amount of more mature dendritic spines in the CA1 and CA3 hippocampal regions of male rats that were housed in an enriched environment. This study utilized twelve rats, which were put into four equal groups: stressed EE, non-stressed EE, stressed SH, and non-stressed SH. After being housed in their respective conditions for 30 days, the six rats from the two stressed groups were emotionally stressed for two hours in restraining tubes, physically stressed in a forced swim test, given a rest period, and then neurologically stressed with dimethyl ether. After perfusion and Golgi-Cox staining, the tertiary dendritic spines in the CA1 and CA3 regions of their brains were then analyzed using confocal microscope and 3D image processing software in order to determine dendritic spine count and the density of mature spines. If this hypothesis were supported, this data would suggest that living in enriched environments allows for the development and maturation of dendritic spines, which enables animals to better respond to life stressors.

Do Anxiety, Depression, and Sleep Disorder Predict Metabolic Syndrome? Analyzing Symptoms in Asian Americans

AIMS: Metabolic Syndrome (MetS) is an array of physiological symptoms associated with higher risk of heart disease and diabetes. The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) defines MetS according to summing cutoff values of blood pressure, fasting glycemia, triglycerides, high-density lipoproteins, and waist circumference. However, MetS, has not been studied with Asian-Americans. In this study, I examined how mental health (anxiety, depression, and sleep disorders) may influence MetS scores in a large sample of 4000+ Asian Americans. METHODS: Data were collected from the medical records of Asian American employees (1184 women, 2132 men; M age = 38 (SD=10)) and spouses of employees working for companies affiliated with a large primary care organization, supplemented by a self-reported health questionnaire. MetS was assessed using the NCEP ATP III criteria (both with and without adjustment of waist circumference for Asian populations), depressive symptoms with the 9–item PHQ, anxiety symptoms with the 7–item GAD, sleep duration with a single item. Data were analyzed separately for women and men because of different cutoffs on different components of MetS. RESULTS: Multiple regression analyses revealed that sleep disorder and anxiety were significant predictors of waist circumference with $\beta = -.55$ and -.10 respectively ($F(3, 2346) = 11.57, p < .001$) and fasting glycemia with $\beta = -.20$ and -.297 ($F(3, 2350) = 9.414, p < .001$). Finally, the study showed that for Asian Americans there exist significant differences between adjusted and unadjusted MetS scales in both men ($t=30.39, p<.001$) and women ($t=20.05, p<.001$).

Traveling and Reading: Cartographies of Sexuality, Movement and Embodiment in Bechdel's Fun Home and Schulman's Girls, Visions and Everything

Both Sarah Schulman and Alison Bechdel worked for WomaNews, a New York City monthly feminist newspaper, between 1983 and 1985. Using Schulman’s Girls, Visions and Everything (1986) and Bechdel’s Fun Home (2006) I attempt to review the strategies of lesbian reading employed by the characters in each text while considering the complexity of genre, the relationship between narrative distance and the reading techniques of lesbian characters while contextualizing them within the changes and developments in queer literary theory and criticism. Lastly, I am concerned with the relationship between lesbian identity, whiteness, reading, and the traveling done within each text. I anticipate that the physical movement of Schulman’s characters as they traverse New York City streets during Reagan’s presidency and the restitution and mediated reproduction of maps by Bechdel act as sites which explores Judith Butler’s question “…so we are out of the closet, but into what? what new unbounded spatiality?”
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**Presenter:** Miranda Trapani, *Behavioral Neuroscience*

Sage Scholars Program  
Co-Authors: Diana Reiss  
Faculty Mentor: Diana Reiss

**Developing methodology of Unmanned Aerial Vehicle Data Analysis using Bottlenose Dolphin (Tursiops truncatus) footage**

The advent of unmanned aerial vehicles (UAVs) as a method of data collection has introduced new challenges in sampling techniques to account for great increases in the precision and types of data now available to researchers. Videos were taken of bottlenose dolphins (Tursiops truncatus) in Belize and multiple behavioral sampling methods were used to determine time intervals that agreed with continuous sampling results of time activity budgets both for social and foraging behaviors. Subsequent time budgets were (will) then (be) analyzed to compare foraging and social habits of T. truncatus across variables such as group size and foraging habitats in Belize to better understand how resources are used in the area and improve conservation efforts.

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**Presenter:** Marielle Ray, *Psychology and English*

Macaulay Honors College  
Co-Authors: Regina Miranda  
Faculty Mentor: Regina Miranda

**Ethnic Differences in the Context of Self-Harm Behaviors and its Correlates**

The relationship between nonsuicidal self-injury (NSSI) and suicidal behavior has been examined extensively in recent literature, and previous research has proposed several conceptual frameworks for understanding the circumstances around the spectrum of these behaviors. However, there is a major gap in the literature in terms of applying these frameworks to the experiences of different ethnic and racial groups; while some research indicates that there may be disparities among ethnic groups in the prevalence and context of NSSI and suicidal behaviors, other research does not support these differences. The Self-Harm Behavior Questionnaire is a self-report measure that collects information on the history of self-harm behavior, and it has been validated for diverse samples of emerging adults and adolescents. The current study identifies and describes group differences in the context and functional aspects of previous suicide attempts and of some suicidal behaviors among a diverse sample of Hunter College students, based on responses to the Self-Harm Behavior Questionnaire. In addition, this study compares mean differences in scores on hopelessness and depression inventories among a subsample of individuals with a history of NSSI, with a history of suicide attempts (with or without additional self-harm behaviors), and with no history of self-harm behavior. The results presented have implications for future research on the importance of ethnic, cultural, and racial identities in the experience of self-harm behaviors. Further, these findings can help inform culturally competent clinical interventions for diverse populations engaging in self-harm behavior.

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**Presenter:** Andres Lojano-Bermeo, *Biochemistry*

Co-Authors: Bernard Kwabi-Addo, Emmanuel Moses-Fynn  
Faculty Mentor: Joshua Ginsberg

**The Effect of Epigenetic Drugs on Prostate Cancer Cell Proliferation and Gene Expression**

The myc proto-oncogene and pTEN tumor suppressor gene are two important genes that are essential for the regulation of normal prostate epithelial cell function. The dysregulation of both genes are implicated in prostate cancer cells, whereby the PTEN tumor suppressor gene is silenced and the c-myc oncogene is overexpressed. My hypothesis is that pTEN and c-myc genes are regulated by epigenetic changes in prostate cancer. The objective of my project is to investigate if 5-Azacytidine, a demethylating drug and
the histone deacetylase inhibitor Trichostatin A are able to modulate the expression of pTEN and c-myc genes in prostate cell lines. Treatment of prostate cell lines (LNCaP, PC3, E00D6AA, and PNT1A) with these drugs caused induction of pTEN expression in prostate cell lines compared to the mock control. In addition, the drugs inhibited proliferation of the prostate cancer cell lines in comparison with the mock control. In conclusion, this study demonstrates that the epigenetic drugs, Trichostatin A and 5-Azacytidine inhibited prostate cancer cell growth by the induction of pTEN expression.

### Presenter: Marysol Finkenberg, Biochemistry
MARC Program, Macaulay Honors College
Faculty Mentor: Spiro Alexandratos

**Understanding Binding Affinities by Fluorescence Spectroscopy in the Design of Polymers for Environmental Remediation**

Ion-exchange resins have important biomedical and environmental applications. Different ligands are used to draw metal ion contaminants from wastewater, groundwater, seawater, and more. Our lab seeks to better understand metal-ligand relationships, and to create a database of ligand affinity that we can refer to when crafting specific resins. In a new direction begun in our laboratory, we are using fluorescence spectroscopy to quantify the ligand affinities by a given metal ion. We start with a complex of europium, a hard metal ion with the capacity to fluoresce, and dipicolinic acid (Eu(DPA)3 3-), and then contact the complex with a ligand. Fluorescence spectroscopy tells us about the environment around europium, specifically whether or not the ligand has replaced DPA. Through these experiments we have found that the anionic ligand etidronate (CCH3OH(PO3)2 4-) effectively binds europium. Theoretically, the concentration of etidronate required to replace DPA in the EuDPA3 complex is indirectly proportional to its affinity for metal ions. As we continue to investigate other ligands, we will use concentration as a basis for understanding their relative affinity. A database of metal-ligand affinity would have tremendous utility in the world of inorganic chemistry, including application to environmental remediation.

### Presenter: Kyle Leighton, Psychology and Chinese
Macaulay Honors College
Faculty Mentor: Amber Alliger

**Enriched Environments Promote the Growth of Mature Spines Resulting in Improved Cognitive Performance**

Previous research from our lab has shown that subjects living in enriched environments have more mature spines found in the hippocampus than those who lived in standard housing. The aim of the current project was to test if there is a correlation between the greater number of spines and cognitive performance, with the hypothesis that the increased density of mature spines will be positively correlated with enhanced long-term memory performance on the radial arm maze (RAM). Forty-eight Spague Dawley rats were raised in either an enriched environment (N=24) or in standard housing (N=24) for 30 days.

Groups of N=12 from each housing group underwent 6 days of RAM training, where the first trial of each day measured long-term memory. After perfusion, brains were stained using a Golgi-cox method and tertiary branches from both the CA1 and CA3 regions of the hippocampus were imaged using a 3D modeling program. Here, the number of immature (stubby and filopodia) and mature (long-thin and mushroom) spines were counted. A repeated ANOVA will be used to correlate the number of spines with the long-term memory scores from our RAM data. We expect that living in an enriched environment promotes the switch of the structural protein PSD-95 from immature to mature spines, which results in better learning and memory retention.

### Presenter: Sofya Oshchepekova, Biochemistry
Thomas Hunter Honors Program, Hunter Undergraduate Research Fellowship
Faculty Mentor: Yujia Xu

**Collagen Self-Assembly**
Collagen is the main structural protein and a major component of connective tissue. It makes up 25-35% of the whole body protein in mammals. Single collagen molecule - triple helix is called tropocollagen. Each tropocollagen molecule is made of three polypeptide strands that have a conformation of left handed helix and form a triple helix together. Polypeptide sequence of collagen is (Gly-X-Y)n, where X and Y is usually Proline, Hydroxyproline or Lysine. Tropocollagen molecules self-assemble and form fibrils. The goal of the experiment was to identify the factors governing the fibril formation. The mechanism of fibril formation is coded within the sequence. It is already known that protein that consists of three repetitive units of amino acid sequences successfully forms fibrils. This study is to test if protein containing only 2 repetitive units would still self-assemble to form collagen fibrils. The 2U protein was produced using a synthetic gene coded in a plasmid and expressed in JM109 bacteria cells. The expressed protein unexpectedly forms precipitate in pH 7 buffer. In order to understand the nature of the precipitates we will investigate the effects of pH, temperature, the buffer components, and the reducing reagents since the 2U protein consists of several Cys residues. The ultimate goal is to obtain the 2U protein in high purity for further research on fibril formation of collagen.

**Characterizing Neurite Growth in the Presence of Novel Terebrid Peptides**

Neurite outgrowth analysis is frequently used to evaluate the effects of chemical compounds on neuronal cell development. This project investigates the neuronal activity of novel venom peptides (teretoxins) from terebrid snails by characterizing the mean neurite outgrowth, mean number of processes, and mean number of branches. PC12 cells, derived from a pheochromacytoma of a rat's adrenal medulla are used as a model for neurotoxicological studies. PC12 have the capability to differentiate and adopt a neuronal phenotype upon addition of nerve growth factor (NGF). A High-throughput screening (HTS) method, which relies on automated image acquisition and analysis was used to efficiently and rapidly measure manipulation in neurite outgrowth and other neuronal parameters after the treatment with teretoxins. For the HTS assay, PC12 cells were treated and stained with HCS CellMask Red and Hoechst 3342 to measure cellular morphological changes. The cells were exposed to different concentrations of Tv1, a bioactive teretoxin from Terebra variegata, at various stages of neuronal differentiation i.e. before, during, and after induction of differentiation with NGF. Measurements pertaining to the mean neurite outgrowth, mean number of processes, and mean number of branches were recorded and analyzed. Preliminary results indicate exposure to Tv1 before/during/after induction with NGF has a substantial effect on neurite outgrowth and branching. This is the first evidence of teretoxins manipulating neuronal cell development.

**Incorporation of Mini T Cell Receptor α Locus Control Region into Lentiviral Vector for Gene Therapy**

Chimeric antigen receptor (CAR) T-cell gene therapy has emerged as a novel treatment for cancer and other diseases. However, this treatment is not without its limitations; the lack of control over the therapeutic gene bearing vector’s integration site makes it susceptible to silencing from the surrounding chromatin environment. Additionally, the lack of a renewable source of T cells carrying the therapeutic gene can require multiple transfusions for the patient. Gene regulatory elements, such as Locus Control Regions (LCRs) may address some of these limitations by providing predictable spatiotemporally controlled therapeutic expression from a vector, regardless of the vector’s site of integration. In order to
translate our basic findings of LCR properties to gene therapy, we aim to incorporate LCR driven transgenes into lentiviral gene therapy vectors. We study the T-Cell Receptor alpha (TCRα) LCR, which as it exists endogenously is too large to fit into a lentiviral vector. Therefore, ‘mini-LCRs’ containing only characterized subregions of the TCRα LCR will be engineered into lentiviral vectors for therapeutic gene delivery. Here, we describe the construction of these viral vectors, and their use in the production of lentivirus-transduced mouse and human cell lines. Ultimately, we will utilize the viruses that are generated to transduce embryonic stem cells (ESC) and will analyze for mini-LCR-driven reporter gene expression during development of those ESC into T cells.

### Health Seeking and Health Service Utilization among Korean Immigrant Women Working in Nail Salons

*Background:* Nail salons are a booming industry that is heavily populated by Asian immigrant workers. Many are drawn to its flexible hours, the ease of start making money, and the fact that high English proficiency is not required. In reality, workers face dangerous working conditions and corrupt labor practices. Many workers are exposed to harmful chemicals without proper protection, and experience underpayment and physical abuse. Moreover, most of the workers are without proper documentations, because they are illegal immigrants, or without insurance, because small nail salon businesses rarely offer insurance to its workers. Purpose: The purpose of this study was to examine the experiences of Korean Immigrant Nail Salon Workers in the Greater New York Area (New York & New Jersey) in regards to individual health seeking and healthcare utilization and to explore their concerns regarding their work environment. Methods: Guided by the Heideggerian hermeneutics approach, Korean immigrants working in nail salons in the Greater New York Area were recruited via on/off line advertisements. Each participant completed a semi-structured interview in Korean and a demographic survey. Then, data was transcribed and any identifiable information was deleted. Modified Diekelman, Allen, and Tanner method was used for data analysis by team approach. Findings: 20 immigrants, with an average age of 38.5 years (23-45) participated in this study. Implications: This study will guide the implementation of culturally sensitive practices across the healthcare system. It can inform healthcare professionals of how immigrants usually seek and utilize health care, and help caregivers approach each patient accordingly.

### NYC’s Criminal Justice Reform Act and Impending Implementation Challenges: Can the Police Department Police Itself?

The Criminal Justice Reform Act (CJRA) was passed by the city council in May and was signed by Mayor Bill de Blasio on June 13th, 2016 with the intention of creating more proportional penalties for low-level, nonviolent offenses. In 2015, New Yorkers received 297,413 criminal summons. The top summonses given to New Yorkers included those for open containers of alcohol, public urination, unreasonable noise, disobeying park rules, and littering. In 2014 alone, there were approximately 10,000 individuals who obtained criminal records for some of these offenses. The CJRA is composed of eight bills that would send about 100,000 low-level, non-violent offenses to civil court instead of criminal court. Offenses fought in civil court, as opposed to criminal court, have less life-altering consequences because of the less punitive penalties employed in civil court. While the act’s title suggests that the it would encompass more aspects of the criminal justice system, it is important to consider the limitations for New York City (NYC) lawmaking vis-à-vis state lawmaking because the City does not have the authority to legislate what is under state law. My research explores the politics and historical trends in NYC broken windows policing, which are precursors for what was addressed and ignored in the passing of the NYC CJRA. Under the CJRA, police officers will continue to have the option to issue criminal summonses for these offenses, which pleases opponents of potential decrease in police discretion, but which raises questions for...
| Presenter: Sujoy Manir, CUNY BA Biomedicine  
| Co-Authors: Mandë Holford, Patrick Kelly  
| Faculty Mentor: Mandë Holford  
| **Bacterial Expression and Purification of a Disulfide-Rich Venom Peptide with Anticancer Activity**  
| Venom peptide toxins, which have been honed for specificity and potency by millennia of evolution, represent a promising source of novel therapeutic compounds. Tv1, a cysteine-rich peptide recently identified in the venom of terebrid snail Terebra variegata is such a compound. Preliminary studies indicate that Tv1 selectively inhibits liver cancer cells. However, the molecular mechanism for this activity remains unknown. As part of a broader effort to study and characterize the activity and possible therapeutic applications of Tv1 a protocol for the heterologous expression and purification of Tv1 in E. coli was developed. This is important because natural Tv1 can be obtained only in minute quantities. While it is possible to synthesize Tv1 using solid-phase peptide synthesis (SPPS), this method is time-consuming and expensive. An efficient protocol for heterologous expression and purification would greatly facilitate efforts to study this promising compound. Similar to most venom peptides, Tv1 is only active in its native disulfide-bond isoform. To address this issue, the Tv1 gene was cloned into an expression vector that incorporates a signal sequence directing the peptide to the periplasm, where the endogenous machinery for the production of disulfide bonds is located. A range of methods, including sonication, freeze/thawing, enzymatic lysis, and two types of affinity chromatography (nickel-sepharose and maltose binding protein), were applied for cell lysis and peptide purification. The purified folded Tv1 product was confirmed by gel electrophoresis and mass spectrometry.  

| Presenter: Amanda Puitiza, Biochemistry and Human Biology  
| Macaulay Honors College  
| Co-Authors: Andrea Baden  
| Faculty Mentor: Andrea Baden  
| **The relationship between social interactions and gut microbiota transmission of Eulemur rubriventer**  
| "In this project, we intend to analyze the different dynamics of gut microbial transmission among a highly social primate species. Red-bellied lemurs (Eulemur rubriventer) are endemic to Madagascar and live in relatively stable, small, monogamous family units. These units typically range from 2-6 individuals in size. They are highly frugivorous, exhibit allomaternal care, and all family members participate in social behavior such as grooming and playing. Gut microbiota profiles, as well as fecal samples, were collected from various individuals of different family groups. An individual's gut microbiota can be considered a genotypic characteristic that is physically manifested. Through social interactions, microbiota can be transferred through contact and can have a direct impact on immunity. Thus, microbiota profiles are good indicators of how the individual interacts with the environment. Comparing genotype with gut microbiota can highlight the relationship between an individual's genotype and its surroundings. My role in this project is primarily to determine the genotypes of these individuals. This includes extracting the DNA from the stool samples and amplifying 10 specific regions of the DNA using PCR. I will use the DNA sequences and gut microbiota profiles for the analysis. We will use social network analysis to examine inter-individual differences in host social behavior and how sociality relates to gut microbial composition. We hypothesize that the degree and level of social interaction is positively correlated with gut microbiota similarity.  

| Presenter: Xiaohui Liang, Biochemistry  
| Macaulay Honors College, Hunter Undergraduate Research Fellowship  
| Co-Authors: Hualin Zhong  
| Faculty Mentor: Hualin Zhong  
| **Yeast Display System Screening of High-affinity Antibody Fragments**  
|
The yeast surface display system can serve as an ideal platform for in vitro display of single-chain variable fragments (scFvs) of antibodies. The system takes advantage of the interaction of Aga1 and Aga2 proteins to present recombinant proteins on the surface of Saccharomyces cerevisiae. The usage of Fluorescence-activated cell sorting (FACS) can make screening for scFvs with a high affinity and/or specificity quicker. We tested the effectiveness of this system using an anti-GFP scFv. We introduced into the yeast cells a plasmid that expresses anti-GFP scFv with a Flag tag at the carboxyl terminus. When induced, these cells would present the anti-GFP scFv-Flag on the cell surface. For analysis, the recombinant GFP protein was used to detect the expression of anti-GFP scFv; a mouse anti-Flag antibody and an APC-labeled donkey anti-mouse secondary antibody was used to detect the Flag tag. We can distinguish the level of GFP binding affinity based on the strength of green fluorescence signal produced by GFP. Similarly, we can check the integrity of the scFv expression by analyzing the red fluorescence of APC. Using this two-color labelling system, we identified cells that had a high binding affinity for GFP and anti-flag antibody. The cells that had strong GFP and APC signals were the ones that presented high-affinity scFvs that were correctly expressed in-frame. For future screening of a library of antibodies that generated through mutagenesis, several rounds of screens with an increasingly stricter threshold will be used in FACS to obtain the yeast cells that express high-affinity scFvs against the antigen of interest. In summary, the yeast surface display system will be powerful and effective in generating antibodies (scFvs) with a high affinity and specificity.

Presenter: **Antonio Cerullo**, Biological Sciences
Macaulay Honors College, Hunter Undergraduate Research Fellowship
Faculty Mentor: Paul Feinstein

**Engineering A Brighter Future: Optimization of Olfactory Tissue Imaging via Novel Red Fluorescent Proteins**

Labeling tissue with fluorescent protein markers through gene insertion is a universally employed strategy to observe biological processes in real-time. Mammalian tissues are most transparent to red wavelengths of light within the excitation or absorption window of 650-900nm as they have rather low absorbance in this range. However, many conventionally used red fluorescent proteins (RFPs), such as mCherry, fail to emanate a practical level of brightness; a dim protein has little use in imaging. Thus, optimization of live tissue imaging lies in engineering fluorescent proteins that have the preferred red wavelength emission spectra and a functional brightness. Directed mutagenesis was used to engineer several genetic variants from eqFP650, a recently developed RFP. These variants were expressed in vitro and then extracted into solution to measure their spectroscopic properties: excitation/emission spectra, extinction coefficient, and quantum yield. Native gel electrophoresis determined whether each fluorescent protein was stabilized as a monomer or as a dimer. These data were used to select optimal fluorophores for imaging purposes. We aim to integrate satisfactory variants into mouse lineages to generate gene-targeted animals so that olfactory tissue may be imaged under more optimal conditions.

Thursday, April 6th, 2017
Poster Session #4
1:45pm–3:45pm

**The Art of Collaboration: A Journey into Theatrical Creation and the Compromises that follow**

Theatre is much more than bright lights and costumes; it is stress, anxiety, and compromise. Each theatrical production is a social experiment in which different creative minds come together to create art, overcoming several obstacles in order to achieve a shared creative vision. I will offer an in-depth look into...
the inner workings of a theatrical production as the role of the director as I navigate myself through the different social and creative interactions I have with designers, production members, and actors. I hope to share my observations of the complexities of theatrical collaboration and the various outcomes that succeed it.

**Presenter: Ji Won Kang, Biochemistry**
Thomas Hunter Honors Program
Co-Authors: Joseph Giovinazzo, Jayne Raper
Faculty Mentor: Jayne Raper

**APOL1 Mediated Lysis of Mammalian Cells Is Driven By Loss of Osmoregulation**

Trypanosome lytic factor (TLF) is a high-density lipoprotein that protects humans against most African trypanosomes, the cause of sleeping sickness. The parasites take up TLF, which carries the channel-forming protein APOL1. These channels cause an imbalance of cellular ion concentration, triggering an influx of water which kills the parasite. While APOL1 protects against most trypanosomes, there exist human-infective trypanosomes. In turn, recently evolved variants of APOL1 have arisen in humans that protect against these trypanosomes, with the caveat that they are strongly linked with kidney disease. In trypanosomes, the initial influx of extracellular sodium ions through the APOL1 pore results in an efflux of potassium ions followed by a shift in membrane potential. This initiates the inflow of chloride ions and increases intracellular ion concentration, leading to an influx of water and ultimately lysis. The inhibition of ion movement across the membrane prevents APOL1-mediated trypanolysis. Similar to trypanosomes, mammalian cells are susceptible to the toxicity of APOL1, however unlike with TLF, the source of toxic APOL1 here is intracellular. We hypothesize that the mechanism of APOL1 mediated lysis in mammalian cells mirrors that of trypanosomes, wherein the loss of osmoregulation triggered by APOL1 is the source of toxicity. We propose that replacing the sodium with larger ions, which can no longer pass through the channels, or adding osmolytes in the extracellular environment will delay the osmotically driven lysis and indicate that APOL1 kills mammalian cells through pore formation.

**Presenter: Khaleel Ali, Biochemistry**
Co-Authors: Stewart Bachan, David Mootoo
Faculty Mentor: David Mootoo

**Synthesis of a Fluorinated Analog of the Immunostimulatory Glycolipid KRN7000**

KRN7000 (also called α-galactosylceramide or α-GalCer) is a synthetic glycolipid that activates invariant natural killer T (iNKT) cells. Modification of the glycolipid structure can bias the immune response to either a pro-inflammatory (Th1) or an anti-inflammatory (Th2) response. Therefore, analogues of KRN7000 are of interest as mechanistic probes and potential immunotherapeutic agents. For clinical applications, molecules that exhibit a polarized response (i.e Th1 or Th2 bias) and measured potencies are required. Consequently, tuning the activity of KRN7000 through structural modifications is a very active area of research. In this context, C-glycosides (i.e analogues in which the glycoside oxygen is replaced with a carbon substituent) of KRN7000 have shown promise for their Th1 bias and potency. We hypothesize that because of the unique electrostatic and conformational properties of fluorine, introduction of a fluorine at the “anomeric” carbon of a C-glycoside of KRN7000 could alter the molecular interactions that underpin cytokine regulation, thereby leading to analogues with clinical potential. Herein, we describe the synthesis of this novel fluorinated C-glycoside of KRN7000. The key step in this synthesis is the reaction between a crotyltin derivative of a fluorinated-C-galactoside and a lipid aldehyde, which results in a mixture of diastereomers at the newly formed chiral centers. The major diastereomer was isolated by chromatography, characterized by NMR spectroscopy, and transformed over 6 steps to the desired fluorinated C-glycoside of KRN7000.

**Presenter: Dina Buitrago, Biology**
Research Initiative for Scientific Enhancement (RISE)
Co-Authors: Zayd, Daruwala, Benjamin Ortiz
**Engineering a Novel Chimeric Locus Control Region with Insulator Activity for Gene Therapy**

The T-cell receptor-alpha (TCR-α) gene locus consists of the TCR-α gene at the 5’ end and the anti-apoptotic DAD1 gene at the 3’ end. The TCR-α locus control region (LCR), situated between these two genes, is composed of a set of cis-acting gene regulatory elements, including an enhancer (that directs TCR-α gene-like spatiotemporal specificity) and other elements that provide insulator-like activity. The latter help provide integration site-independent expression to a linked transgene. We hypothesize that linking the insulator-like elements of the TCR-α LCR with the enhancer regions of a different gene can direct integration site-independent transgene expression with a spatiotemporal pattern distinct from that of the TCR-α gene. To test this hypothesis, we will synthetically combine the enhancer region of the human CD2 (hCD2) gene LCR to the insulator elements of the TCR-α LCR and thus create a “chimeric” LCR. The novel hybrid LCR will be linked to a reporter gene and transfected into embryonic stem cells. In vitro differentiation of those stem cells into T cells should produce transgene expression with an hCD2 gene-like pattern. Analyzing the reporter gene expression levels and cell type-distribution will assess both enhancer and insulator activities of the chimeric LCR. Because the hCD2 gene is expressed beginning at the earliest stages of T cell development, the activity of this novel chimeric LCR can be applied to treatment of T cell immunodeficiency diseases.

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**Cup Plays a Major Role in osk mRNA Repression During Early Drosophila Oogenesis**

In recent years, we have begun to understand that mRNA has a larger role than being an intermediate between DNA and protein. Post-transcriptional gene regulation at the mRNA level plays a major role in embryogenesis and neurogenesis. At the same time, sub-cellularly localized mRNAs are extremely important when rapid response is necessary, due to external signaling. *D. melanogaster* oogenesis has been shown to be an excellent model system to study mRNA regulation, such as the process of transport, localization, and post-transcriptional regulation of maternal mRNAs. As the mRNA is transcribed in a nurse cell nucleus and transported into the oocyte, trans acting factors bind, creating an RNA:protein (mRNP) complex. There are several factors that play a role in the transport and the translational repression of oskar mRNA in order to ensure proper spatial and temporal expression of the protein. One of the proteins that plays a role in oskar mRNA translational repression in the oocyte is Cup. During oskar mRNP transport, Cup is able to prevent the translation of oskar mRNA via binding of eiF4E, at the eiF4G binding site, therefore inhibiting the formation of the translation initiation complex. Once the oskar mRNP reaches the posterior, through an unknown mechanism all of the factors needed for translational repression are removed and the Oskar protein is expressed. Cup’s role during early stages of development is less well understood. I would like to elucidate when and where Cup joins the mRNP complex and exerts its translational repression activity. I will be taking advantage of a new technology of single molecule fluorescence in-situ hybridization (smFISH) to detect oskar mRNA and Cup simultaneously in fixed egg chambers in order to assess their colocalization. In a concurrent experiment, I will knock down Cup protein to determine if there is any premature expression of Oskar protein which will prove our hypothesis of Cup’s role during early stages of development.

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**The Politics in Science**

I intend to discuss research where the findings seem to reinforce gender, sexuality, class, and race in western culture. This places a concern on scientists on how preconceived understandings of their subject
creates biased results that are then later reinforced in doctors’ offices. I believe it is important to explore medical institutions and better analyze how science, though perceived as unbiased truth, fails to notice how they reinforce complex forms of oppression. By uncovering research throughout history, it can expose “sexist and androcentric assumptions that are ‘the dominant belief of an age’—that is, that are collectively (versus only individually) held” (Harding, 52). This can then be used to better address recent studies that still hold cultural beliefs and discuss changes that can maximize objectivity. Complaints and Disorders by Barbara Ehrenreich is a crucial book to my project, as it uncovers a history of doctors using the power of science to make certain claims of women's bodies. I expect to find the harsh reality that science is a powerful tool that very easily falls into the trap of institutionalized racism, sexism, and homophobia. I foresee these forms of oppressions to intertwine and either work in favor or against each other. By that, I mean that as a woman, class and race also play an important tool as to what sorts of assumptions are being made. This will prove to be a challenge to discuss all standpoints without subjecting my own biases. And open up the floor to methods that can provide scientists to produce maximized objective knowledge, which I believe the field lacks very much of. Then perhaps science can finally claim the title of empirical truth.

Limited Proteolysis of CWC2/ RBM22

The spliceosome is a large and complex molecular machine comprising small nuclear (sn)RNAs and proteins that catalyzes removal of introns from precursor mRNA. CWC2 (from yeast) and RBM22 (human homologue) are proteins directly involved in folding of the snRNA catalytic center of the spliceosome. Each protein involves a structural core and unstructured regions whose functions are not completely understood. In order to understand the functional roles in folding of the snRNA catalytic core, we are analyzing structure and interactions of the full length and stable structural domains. In this project, limited proteolysis was performed on CWC2 and RBM22 to obtain the stable structural fragments. Limited proteolysis is a biochemical method where a protein is incubated with relatively low concentration of a protease at mild conditions, cutting at recognition sites throughout the protein, to identify smaller stable polypeptide fragments. Limited proteolysis was optimized for each protein using GluC protease by monitoring the reaction at different incubation time and different protease's ratio and analyzed by SDS-PAGE to identify the cleavage products. By this method we found that the full length of (His)6 CWC2 (MW: 441558) and (His)6 RBM22 (MW: 50264) yield stable fragments of approx. 30kDa and 41kDa, respectively. Following the digestion, the fragments were purified by size exclusion chromatography (SEC) and fractions were analyzed by SDS-PAGE. The samples are being analyzed by mass spectrometry at the MS Facility at Hunter to characterize better the purity and composition of the stable fragments, after which we will test for binding to RNA.

Heterosexuals’ Empathy, Prejudice, and Willingness to Advocate for LGB Rights Before and After the 2016 Presidential Election

Previous literature on intergroup dynamics has shown advocacy for minority rights to be related with higher levels of empathy and contact with minorities. To examine the effects of intergroup contact on willingness to advocate for another group’s rights, we manipulated contact experimentally via a 20-minute online conversation between two strangers. In this study, 80 heterosexual undergraduates were randomly assigned to one of two conversation conditions that varied based on the intimacy of the questions asked. After completing the conversation with a LGB identified confederate, we assessed participants’ empathy and prejudice towards LGBs. However, at the midpoint of data collection, Donald Trump was elected as president, which has had a cascading effect in uniting many Americans in
metropolitan areas to focus on group equality and equal rights. Consequently, we examined whether empathy and willingness to advocate for LGB rights increased, and if prejudice towards LGBs decreased after the 2016 election. t-tests comparing mean levels of attitudes and intentions in our pre- (n = 53) vs. post- (n = 27) election day groups revealed significant differences: In both conditions, levels of participant empathy towards LGBs increased (p < .01); levels of prejudice towards LGBs decreased (p < .01); and participants’ willingness to advocate for LGB rights increased (p < .05). With reductions in prejudice and increases in empathy and advocacy, our findings suggest a counter-culture effect where previously underrepresented minority groups are being brought out into prominence and increasingly supported despite the President’s often exclusionary rhetoric.

### Health Seeking and Health Service Utilization among Chinese Immigrant Women Working in Nail Salons

The nail salon industry has been growing and most of these workers in the Greater New York are Chinese and Korean immigrant women. They are constantly exposed to chemicals and carcinogens at work and as most of them are at a childbearing age, they are at higher risk of breast cancer, skin irritation, lung diseases, infertility, and adverse birth outcomes. Regardless of known health concerns, not many studies are conducted. The purpose of this ongoing research study is to investigate the health concerns, health problems, and health service utilization of female Chinese immigrant nail salon workers in the Greater New York region. Andersen’s Behavioral Model of health services utilization will guide survey development and data analysis. Total 120 female Chinese immigrant nail salon workers, aged between 18 and 45 and currently working in Greater New York (New York City and New Jersey) will be recruited. Data will be collected anonymously via in-person, online, and mail survey. The survey includes questions about their current healthcare utilization, health practices, work environment, demographics, and current healthcare conditions. Data will be analyzed through descriptive statistics and multiple linear regressions. Due to low socioeconomic status among female Chinese nail salon workers, it is a burden for them to seek expensive healthcare services. Furthermore, with cultural and language barriers, these women are less likely to seek health services. This study hopes to develop culturally sensitive community based health screening services and to provide health education for better health care access and health promotion.

### Amelioration of EAE in NMIIB Knockouts

"Multiple sclerosis is an autoimmune disease which is characterized by the degeneration of the myelin sheath around axons, ultimately leading to axonal death. This disease is due to an immune system malfunction which causes the body to target and destroy its own myelin. Oligodendrocytes (OLs) are the glial cells that produce myelin in the central nervous system and have been heavily researched for their role in multiple sclerosis therapies. Non-muscle myosin IIB (NMIIB) is a motor protein which binds to actin and plays a role in inhibiting the differentiation of oligodendrocyte progenitor cells (OPCs) into myelinating OLs. The inactivation of NMIIB in OPCs leads to their accelerated differentiation into myelin producing OLs and increases the branching that OLs undergo to myelinate multiple axons in the CNS. We have used a well characterized model of multiple sclerosis in mice called experimental autoimmune encephalomyelitis (EAE). This model causes the immune system to attack and destroy the myelin basic protein (MBP) that constitutes the myelin sheath and is representative of multiple sclerosis in humans. The use of immunochemistry allows us to visualize targets specific to inflammation, loss of myelin, and axonal degeneration. Our data indicates that conditional ablation of NMIIB in adult mouse brain, promotes faster lesion resolution and remyelination when compared to that observed in control brains,
as well as fewer lesions in the spinal cord and lower clinical scores in our EAE experiments. Taken together this data provides novel target for promoting myelin formation and repair in adult brain, as well as providing a possible target for future MS therapeutics.

**Primate vs. Parasite: Role of Gorilla APOL1 in Trypanosoma Brucei Infection**

Trypanosomes are parasites that cause disease in mammals. Trypanosoma brucei brucei is an exclusively animal-infected trypanosome that causes trypanosomiasis. Several primate species, including humans and baboons, express a protein that renders them immune to T. b. brucei. This protein, known as APOL1, is found on trypanosome lytic factors (TLFs) which are a type of high density lipoprotein (HDL) complex. Primate APOL1 proteins form pores in the membrane of T. b. brucei, resulting in their death by osmotic imbalance. APOL1 is a relatively new protein evolutionarily and, since its appearance ~24 million years ago, has been adapting in response to the parasitic threat that trypanosomes pose. For example, while certain trypanosome parasites can overcome the effects of human APOL1 to cause human sleeping sickness, baboon APOL1 has evolved to lyse all African trypanosomes. There is a scarcity of research about the nature or pore-forming ability of Lowland Gorilla (Gorilla gorilla) APOL1. Our goal is to characterize and understand the role of gorilla APOL1 in immunity. We generated transgenic mice that express the synthetic gene that codes for Gorilla APOL1 and the serum from these mice killed trypanosomes. We hypothesize that mice that produce this protein will be protected from infection by T.b.brucei. With recent significant decreases in gorilla species populations, it is crucial that we understand the structure and function of their APOL1 before their extinction in order to further our understanding of the molecular evolutionary relationship between trypanosomes and primate APOL1.

**Antibacterial Properties of Oregano’s Essential Oil**

The essential oil of oregano, a common household herb, has been shown to demonstrate antibacterial properties. The factors that influence these properties of the essential oil are not exactly known. However, it has been shown that the bacteria that colonize other medicinal herbs contribute to their immune-boosting/antibacterial properties. Based on the results of this research, we hypothesize that the bacterial colonies that grow on the oregano plant contribute to the antibacterial properties of its essential oil. To test this, we must understand the composition of the compound and their relation to the host plant and the bacteria. We propagated liquid cultures of the bacteria that inhabited the oregano stem. After a period, we extracted the secondary metabolites produced by the bacteria in the culture. These secondary metabolites are likely to play a role in how the bacterial community communicates with its host plant. Thus far, we conducted several Thin Layer Chromatography (TLC) tests to identify potential target compounds of interest. Future work aims to characterize these identified metabolites. We will conduct mass spectroscopy and NMR spectroscopy to collect more information on their structures. Efficacy of these molecules will also be examined with biological assays. Furthermore, we will use bioinformatics tools in order to study the biosynthetic pathways that mediate the production of these molecules. With the rise of antibiotic resistance to conventional treatments, the discovery of new and alternative antibacterial compounds is essential to combating this issue.
The Role of Transcriptional Repressor CTCF in the Generation of Alternative Polyadenylated Isoforms of the p21 Gene

APA (alternative polyadenylation) events are rapidly becoming a new model to study gene expression control, representing an important mechanism for dynamic changes in cellular function. Preliminary data suggests that the use of APA sites in the p21 gene is affected by DNA damage. Previous research has demonstrated that UV damaged cells in the p21 gene favor transcription termination in the first intron over the canonical site in the last exon. In addition, the first intron can also be further processed through splicing, which generates both a spliced and unspliced intronic form of the p21 gene. Identifying and understanding the role of the transcriptional repressor CTCF on the generation of the intronic APA isoforms of the p21 gene will improve current research on the DNA damage response in the p21 gene. Here we employ the use of Chromatin Immunoprecipitation (ChIP) and quantitative Polymerase Chain Reaction (qPCR), in order to identify the role that CTCF plays in the generation of the intronic APA isoform of the p21 gene. Following this method, we expect that although CTCF expression increased the production of the spliced intronic form of the p21 gene, it will not increase the expression of the unspliced intronic form. Our results will exemplify how the use of ChIP and qPCR can be used to determine how particular proteins affect DNA expression. The methods employed in this project pave a route to explore the effects that alternative DNA and RNA binding proteins have on intronic APA isoforms.

One Child Policy- The Paradox of the Chinese Century

The rapid economic growth of China astounds the world; several key factors enable China GDP to increase by up to 10% per year. Factors such as the culture attitude of the Chinese people as well as the sheer population of the workforce produce an increase in the middle class. A centralized government is also credited as a powerful tool in efficiently stabilizing the economy and building a guideline and flexibility despite corruption. However, the one-child policy created several adverse effects that will linger to the next generation. Completely changing the cultural attitude of the Chinese population as well as significantly tipping the demographic of the population toward males. The increase in education also results in the increase in demand of freedom resulting in a rather political destabilize observed in several universities across China. Blue collar jobs are less desirable, while the demand for white collar jobs cannot be met by the requirements of the market. China is facing an invisible crisis that can potentially prevent the country from achieving the "Chinese Century."

Fidgetin-like 2 is a novel microtubule regulator of axon growth

The microtubule (MT) cytoskeleton is a key regulator of axon growth, and has been studied as a potential therapeutic target for enhancing axon regeneration after injury. Here, we investigated the effects of a novel MT regulatory protein, fidgetin-like 2 (FL2), on axon growth. FL2 is a microtubule severing enzyme which was found to suppress directional cell motility by severing dynamic MTs at the leading edge of migratory cells. In neurons, we find FL2 accumulates in growth cones and distal ends of neurites, which led us to hypothesize that FL2 may negatively regulate axon regeneration by paring down dynamic MTs in the distal axon. To test this, we transduced dissociated adult rat dorsal root ganglion (DRG) neurons with Adeno-Associated Virus Type 5 (AAV5) containing a plasmid encoding shRNA against FL2 or control shRNA and quantified the neurite growth rate. Depletion of FL2 significantly increased the rate of neurite growth. To test if FL2 selectively severs dynamic microtubules, neurons were dual-stained for either polyglutamylated or tyrosinated tubulin (markers of stable or dynamic microtubules, respectively), and α III tubulin (which labels all MTs in neurons). With FL2 depletion, we observed an increase in the ratio
of tyrosinated tubulin and a decrease in the ratio of polyglutamylated intensities, indicating a shift toward more dynamic MTs. Our data identify FL2 as a novel regulator of axon growth, which suppresses growth cone advancement by paring down dynamic MTs in the distal axon, and which may be a promising therapeutic target for promoting axon regeneration after injury.

| 87 | Presenter: **Michael Vaysblat**, Biochemistry  
|    | Honors Chemistry and Honors Psychology  
|    | Co-Authors: Stanley Chen, Tony Fung, Alec Seidenberg, Regis Shanley, Ryan Chan, Jennifer Shmukler, Annas Alokush, Sharon Brenner, Edward Hernandez, Allyson Friedman  
|    | Faculty Mentor: Allyson Friedman  
|    | Neurophysiological Mechanisms of Stress Coping Strategies  
|    | Determining the mechanisms underlying coping strategies, active or passive, and the gender differences associated with such mechanisms are of therapeutic interest. The firing activity of the ventral tegmental area’s (VTA) dopamine (DA) neuron serves as an indicator of an individual’s resilience or susceptibility to depression after undergoing stress. The VTA influences neuronal activity throughout the brain via dopaminergic pathways and may be critical in determining the coping strategies of individuals in stressful situations. To further understand the role of the VTA in coping behaviors, we used male and female (C57BL/6J) mice and performed a 10-day repeated variable social stress (RVSS) model of depression to identify mice that are susceptible and that are resilient to such stressors. These stressors included overcrowding, home cage instability, exposure to predator odor, and witnessing or undergoing confinement. Coping strategies during the model differed between the sexes, with a significantly higher number of males displaying active coping behaviors than females. After undergoing this model of depression, susceptible mice are more likely to show signs of depression, such as social avoidance, while resilient mice are more likely to remain psychologically stable. Brain slice electrophysiology was then utilized to record the activity of the VTA DA neurons. These findings will provide a mechanistic insight into the varied behaviors. |

| 88 | Presenter: **Toni Forde**, Economics  
|    | Faculty Mentor: Randall Filer  
|    | For Better, For Worse: The Effect of Maternity Leave Policy on Divorce Rates  
|    | The Family and Medical Leave Act (FMLA) of 1993 was implemented with the goal of helping employees better balance their work and family responsibilities by allowing them to take unpaid, job-protected leave for specified family and medical reasons, including the birth and care of a newborn child. Prior to 1993, maternity leave legislation in the United States varied from state to state. The implementation of the FMLA thus created a “natural experiment” via which we can study the effect of the law on marital stability across states. We postulate that increased maternity leave reduces stress in the household after the birth of a child leading to greater marital stability and reducing the likelihood of divorce. Using data from the March Current Population Survey (CPS) and difference-in-difference techniques we examine the effect of the FMLA on divorce rates at the state level. Rather surprisingly, results indicate that the FMLA has had no statistically significant effects on divorce rates. |

| 89 | Presenter: **Emilia Mikrut**, Psychology  
|    | Muse Scholarship, Thomas Hunter Honors Program  
|    | Co-Authors: Aliza A. Panjwani, Rebecca Cipollina, Tracey A. Revenson  
|    | Faculty Mentor: Tracey A. Revenson  
|    | When Remission Isn't Enough: How Fear of Recurrence and Intolerance of Uncertainty affect Psychological Adjustment among Parents of AYAs with Cancer  
|    | *Intolerance of uncertainty (IU), the tendency to perceive possibility of future negative events as threatening, has been related to psychological disorders; however there is limited research how IU
shapes psychological adjustment among family members of cancer patients. The aims of the current study were to: 1) examine levels of psychological distress among middle-aged parents of adolescents and young adults (AYAs) with cancer; 2) determine if parents’ levels of IU predicted greater anxiety, depressive symptoms and post-traumatic stress; and 3) evaluate if fear of recurrence mediated these relationships. Data were collected through an online survey of 65 middle-aged parents (92% female) of AYA cancer patients aged 14-39. Standardized measures of Intolerance of Uncertainty, Fear of Recurrence, Generalized Anxiety Disorder, Post-traumatic Stress, and Depressive Symptoms were included. Many parents reported mild to moderate levels of anxiety, but moderate to severe post-traumatic stress and depressive symptoms. Multiple regression analyses revealed that IU significantly predicted all three indicators of distress (p’s < .001). High fear of recurrence partially mediated the relationships between IU and anxiety (beta = .09; 95% CI: .05, .16); IU, depressive symptoms (beta = .12; 95% CI: .06, .20); IU and post-traumatic stress symptoms (beta = .51, 95% CI: .30, .82). These findings indicate that fear of recurrence may be one mechanism underlying the relationship between IU and high distress among parents of AYAs with cancer. This suggests that addressing the fear of recurrence may be beneficial in managing intolerance of uncertainty in the context of parenting a child with cancer.

**Criminalizing Hate: The Failure of Carceral Anti-Violence Activism for LGBTQ+ People**

Much of the activism around preventing anti-LGBTQ+ violence in the past decade has focused on passing hate crime protections. Many of these efforts have succeeded, but despite that success, anti-queer violence, namely violence targeted at queer folks of color, has only risen. My research seeks to answer this apparent paradox. I find that not only do hate crime laws fail to deter anti-queer violence, it actually makes it worse. I argue that hate crime legislation only perpetuates existing oppressive structures, most notably the prison-industrial complex.

**New Approaches for the Discovery of Novel Natural Products**

The Discovery of novel natural products via microbe-microbe interactions has the potential to uncover many unknown molecules which could be utilized for the development of new therapeutic agents and materials. However, traditional methods inability to promote bacterial survival in a laboratory coupled with bacteria unable to produce most molecules encoded within their genetic material has greatly hindered new discovery. To combat these problems, the bacteria for my project were grown as a mixed culture. Moreover, it was hypothesized that changing the living conditions within the culture medium would pressure the bacteria to suppress or make different molecules to adapt to their new surroundings. The microbes grown for this experiment originated from Raw Honey and Wheat grass and sterilized dish sponge acted as the new environment within the bacterial cultures. Thin Layered Chromatography was then used to compare the variation of molecule production in the presence and absence of the sterilized sponge. The results, represented as spots on a silica plate, showed that in the presence of dish sponge, bacteria from the Honey culture stopped producing certain molecules, whereas bacteria from the wheat grass culture produced new molecules. In conclusion, growing bacteria as a mixed culture and changing their environment are good ways to increase the chances of finding new novel molecules. Subsequent experimentation will be to characterize molecules produced in my cultures and in due time, theorized biological effects and applications of the natural products such as being used to induce tissue regeneration are the next goals for my project.