26TH ANNUAL BROOKLYN COLLEGE SCIENCE DAY

Brooklyn College

PROGRAM

9:30 AM   **POSTER SETUP (Student Center)**

10:00—12:00   **STUDENT PRESENTATIONS AND JUDGING**
(2nd floor)

12:15 PM   **LUNCH IN THE GOLD & MAROON ROOMS**
(6th floor)

12:30 PM   **WELCOME AND REMARKS**

PRESENTATION OF AWARDS
High School Division
Undergraduate Division
Graduate Division

ALL ARE INVITED TO LUNCH IN THE GOLD & MAROON ROOMS

PRESENTER KEY
High School — [HS]
Undergraduate — [UN]
Graduate — [GRAD]

PSY – 1 PERCEPTUAL TRAINING IS LESS EFFECT FOR MOTION THAN OTHER LOW-LEVEL VISUAL FEATURES FOR VISUAL REMEDIATION IN SCHIZOPHRENIA

Joseph I. Narovlianski (UN) and Daniel D. Kurylo, Psychology Department, Brooklyn College, The City University of New York

Past experiments on perceptual organization in schizophrenia validate perceptual learning of visual grouping tasks. These tasks entail the discrimination of stimulus components that are progressively reduced in similarity. However, studies of low-level stimulus features showed ambiguous associations among task training, type of feature, and perceptual learning efficacy. How these variables interact to efficiently induce perceptual learning is still at hand. We hypothesized that an interaction exists between training task and feature type, which affects perceptual learning efficacy for patients with schizophrenia. To test this hypothesis, two patients meeting DSM-IV criteria for schizophrenia and six healthy control subjects were trained on a two-alternative forced-choice visual discrimination task. Participants discerned the perceptual similarity of stimulus elements that were grouped vertically or horizontally. Four stimulus features were examined: color, luminance, orientation, and motion. These features represent primitive stimulus dimensions that are initially processed by the visual system. Results indicated differences in training effects across stimulus feature. Specifically, control subjects improved least on the motion condition than the other three features. Patients improved on color, luminance, and orientation, but performance declined on the motion condition. These data suggest that training engenders perceptual learning in both healthy individuals and those diagnosed with schizophrenia. However, the processing of motion represents a special case in which perceptual training is less effective at improving performance and may reflect increased computational load. Thus, perhaps neural mediation of motion is less open to neural plasticity or other adaptive changes that result from training.

PSY – 2 INTERACTION BETWEEN PRENATAL MATERNAL STRESS AND AUTONOMIC AROUSAL IN PREDICTING CONDUCT PROBLEMS AND PSYCHOPATHIC TRAITS IN CHILDREN

Yu Gao,[1, 2] **Yonglin Huang** (GRAD)[2]
[1] Department of Psychology, The Graduate Center-CUNY, New York, NY 10016
[2] Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

Evidence has suggested that neurobiological deficits combine with psychosocial risk factors to impact on the development of antisocial behavior. An emerging topic of interest is how psychological stress during pregnancy can affect the fetus and lead to a myriad of adverse outcomes including altered brain development, compromised physical and mental health, and behavioral problems in the child. The goal of the present study was to determine whether the interplay of prenatal maternal stress and a robust biological correlate such as, autonomic arousal predicts antisocial behavior and psychopathic traits. Prenatal maternal stress was assessed in 295 8-to 10-year old children through caregiver's retrospective report. Resting heart rate and heart rate variability (HRV) measures were collected from the child. Both the child and caregiver reported on child's antisocial behavior and psychopathic traits. Our results indicated that higher prenatal maternal stress was associated with higher caregiver-reported antisocial and psychopathy scores, even after the concurrent measure of social adversity was controlled for. As expected, low heart rate and high HRV were associated with high antisocial and psychopathic traits. More importantly, significant interaction effects were found; prenatal stress was positively associated with narcissism, impulsivity, and callous-unemotional traits only under the conditions of low arousal (e.g., low heart rate or high HRV). These findings provide further support for a biosocial perspective of

antisocial and psychopathic traits, and illustrate the importance of integrating biological with psychosocial measures to fully understand the etiology of behavioral problems.

PSY – 3 SMALL ELEPHANTS AND BIG NEEDLES: PERCEPTUAL INFORMATION DOES NOT GENERALLY AFFECT THE PROCESSING OF WORDS

Natalie A. Kacinik,[1,2] **Kole Norberg** (UN),[3,4] Elliot Klein,[3] Miriam Feintuch,[3] Ariella Goldberg,[3] Leah Samouha[3]

[1] Department of Psychology, Brooklyn College, City University of New York
[2] Graduate Center, City University of New York
[3] Brooklyn College, City University of New York
[4] Kingsborough Community College, City University of New York

There is considerable evidence that representations of word meaning are "embodied" and grounded in our perceptual and motor experiences (Barsalou, 2008; Glenberg, 2010; Hauk et al., 2004; Zwaan et al., 2002). However, prior research in our lab has not supported this theory because perceptual information was not incorporated into existing representations of words sufficiently enough to alter their processing in recognition memory and property judgment tasks. In the current study participants performed lexical (word/nonword) and semantic (natural/artificial) judgments on the same stimuli to determine whether variation in a word's appearance (i.e., font size manipulated to be congruent or incongruent with an object's actual size) would affect the processing of that word in more immediate "online" tasks. For example, would presenting a word like "mansion" in a perceptually congruent (i.e., large) or incongruent (i.e., small) font, respectively, facilitate or hinder the speed and accuracy with which the word is processed. In accordance with our previous finding, the results showed that font size did not significantly the speed and accuracy of participants' judgments about the words in either the lexical or semantic decision tasks. This research therefore presents a challenge for embodied accounts of word meaning, particularly since most of the support is based on more immediate priming and interference tasks. Some potential reasons for this discrepancy will be provided and discussed.

PSY – 4 HOW DOES THE TYPE OF SUBSTRATE EFFECT THE SIZE OF MONK PARAKEET (*MYOPSITTA MONACHUS*) NESTS?

Mie Abouelkheir (HS), Midwood High School, Brooklyn, NY and Frank W. Grasso, BCR Lab, Department of Psychology, Brooklyn College, The Graduate Center at CUNY

The Monk parakeet, *Myiopsitta monachus*, has a sophisticated nesting structure that coincides with its complex social interactions. The parrots are able to transform many spaces into nest-bearing shelters. They are known to build on all different types of substrates, including man-made structures like telephone poles, air conditioners and building ledges in addition to natural structures like trees. After photographing the nests-from a measured distance and a measured angle of inclination, we used Adobe Photoshop to estimate the sizes of the nests. Using reference markers we converted pixels of on the nest into horizontal and vertical sizes of the nests and used these to compute nest cross-sectional areas. The results showed that nests built on trees were taller (average= 60.8+/-45.7 SD) and wider (average= 93.6+/-78.3 SD) with an average area of 8571.3+/- 11073 inches squared. Nests built on man-made structures were smaller (average= 20.2+/-5.3) and less wide (average= 24.10 inches +/- 9.1) with an area of 518.4+/- 362.7 inches squared. The purpose of this project is to further understand the behavior and psychology of these highly intelligent species. In communities with large Monk parakeet populations, it is important to understand how the nests vary in size depending on where they build their nests. This can help us avoid putting hazardous materials in such areas. Since Monk parakeets build on utility poles

they pose as fire hazards. Often times, firefighters and cable companies have no choice but to remove the nests- leaving the parakeets without shelter. Some solutions that may arise from this data could be the development of a new type of utility pole that could have a special area for the possibility of a nest being built.

PSY – 5 WHEN ARE ADOLESCENTS ADULTS? ASSESSING COGNITIVE THREAT UNDER STRESS

Camille A. Gregory (UN),[1] Ali Cohen,[2] Kaitlyn Breiner,[3] Danielle V. Dellarco,[2] Melanie R. Silverman,[2] Adriana Galván,[3] B.J. Casey[2]
[1] Brooklyn College, Brooklyn, NY
[2] Sackler Institute for Developmental Psychobiology, Weill Cornell Medical College
[3] Psychology Dept., UCLA

An individual is typically considered an adult at 18, although the age of adulthood varies for different legal and social policies. A key question is how cognitive capacities relevant to these policies change with development. The current study uses an emotional go/nogo paradigm and functional neuroimaging to assess cognitive control under a sustained state of negative arousal in a sample of 110 thirteen to twenty-five year olds from New York City and Los Angeles. The results show diminished cognitive performance under negative emotional arousal in 18 to 21 year-olds relative to adults over 21 that is paralleled by decreased activity in fronto-parietal circuitry, implicated in cognitive control, and increased sustained activity in the ventromedial prefrontal cortex, involved in emotional processes. These findings suggest a temporal developmental shift in cognitive capacity in emotional situations that coincides with dynamic changes in prefrontal circuitry. These findings are important because they may inform age-related social policies.

PSY – 6 LET'S PLAY PONG! ERRORS IN 3D TARGET ESTIMATION DEPEND ON ECCENTRICITY

Darwin Romulus (UN),[1] Jacqueline M. Fulvio,[2] Bas Rokers[2]
[1] CUNY Brooklyn College, Brooklyn, NY
[2] University of Wisconsin-Madison, Madison, WI

The goal of the study was to investigate how people perceive moving objects in three-dimensional environments. In a previous study, through a 3D motion perception task inspired by the classic game of Pong, it was discovered that observers misreport and confuse the direction of motion in depth i.e., approaching objects are reported as receding and vice versa. In this study, the objective was to investigate how 3D motion perception varies across the visual field and see whether shifts in target position in peripheral vision lead to similar error estimations found in the previous study. Using a virtual reality head mounted display, observers engaged in task similar to the previous 3D pong task and were instructed to estimate the direction of targets in central and peripheral vision. Just like the previous study, for centrally located targets, it was found that observers significantly made more errors of estimation of the direction of targets moving in depth than lateral moving targets. There was also a significant increase of error estimation in the proportion of lateral moving targets for peripherally located targets.

PSY – 7 EFFECTS OF HIGH DEFINITION TRANSCRANIAL DIRECT CURRENT STIMULATION (HD-TDCS) ON MEMORY

Sandry Garcia (UN), Rifat Ahmed, Elizabeth Chua, Department of Psychology, Brooklyn College

There is much interest in using non-invasive brain stimulation to improve memory. Two brain regions that play a role in semantic retrieval are the anterior temporal lobe (ATL) and the dorsolateral prefrontal

cortex (DLPFC). The main goal of this experiment was to compare the effects of HD-tDCS, a form of non-invasive brain stimulation, over DLPFC and ATL on different types of memory tests, namely recall and recognition, using a general knowledge task. Because effects of tDCS on behavior may vary by difficulty, we also manipulated question difficulty. In three sessions, participants received HD-tDCS over a particular brain region (DLPFC, ATL or sham). Participants (n=25) completed a general knowledge task, in which they answered one hundred questions in blocks that varied in difficulty. First, they tried to recall the answer, then they made a feeling-of-knowing judgment, and finally completed a recognition task. There was a significant effect of tDCS on number of answers recalled [$F_{(2,48)}=5.001$, $p<0.02$], with fewer answers recalled with DLPFC stimulation (29.2 ± 2.00) compared to ATL (34.72 ± 2.58) and sham (32.16 ± 2.12) stimulation. This was consistent across all levels of question difficulty, with a main effect of tDCS [$F_{(2,48)}=5.01$, $p<0.02$], but no interaction between tDCS and difficulty. Although recall of answers to general knowledge questions was worse with tDCS over the DLPFC, the proportion of non-recalled answers that were later correctly recognized was higher with DLPFC stimulation (0.41 ± 0.02) compared to ATL (0.35 ± 0.015) and sham stimulation (0.34 ± 0.015). The finding that HD-tDCS over the DLPFC worsened recall and improved recognition indicates that the format of the test is important to consider when developing tDCS as an intervention.

PSY – 8 THE EFFECTS OF POWER POSES ON IMAGE RECOLLECTION

Anthony James (UN), **Issak Proano** (UN), Stephon Broome, Eyram Ganu, Dominic Grieco, Keishawna Jones, Angelo Khan, Nikki Martinez, Jannel Tillman, Elizabeth Colon, Sean Shields, Alejandro Zuniga, RISE, Brooklyn College

We conducted a study (n=66) that investigated the effects of high- and low-power poses on memory recollection. In this experiment we tested pre/post performances recalling a random series of 25 pictures. Subjects were divided into three groups (high-power, low-power and neutral) and after the baseline recollection task (pre-treatment), subjects were instructed to hold an assigned power pose for two minutes. Each subject was then given a post-treatment recollection task with a different series of random images. In analyzing the data, we found that power posing does have an effect on memory recollection as the high-power subjects recalled more images than the low-power subjects. We attribute this to physiological hormone changes (e.g. testosterone and cortisol) with subsequent confidence increases (high-power group) or confidence decreases (low-power group), but further studies are needed to confirm.

PSY – 9 MONK PARAKEETS INCREASE NEST CONSTRUCTION BEHAVIOR DURING THE MATING SEASON

Noor Asif (HS), Midwood High School at Brooklyn College and Frank W. Grasso, BioMimetic and Cognitive Robotics Laboratory, Department of Psychology, Brooklyn College

The monk parakeet (Myiopsitta monachus) is native to Argentina and has established thriving populations in urban communities in Europe and across the US. Very little is known about this non-native species and it would be beneficial for us to have knowledge of these birds since they live in our neighborhoods and may cause health problems. They are the only parrots that build huge, shared nests year-round. We tested the hypothesis that when mating season approaches, parakeet nest construction activity will increase. Parrot mating season in Brooklyn is March-April. We made 95 observations of five minute duration on 5 nests in Brooklyn between January and April of 2016. During these observations we counted the number of sticks carried, added to the nest, the number removed from the nest, and the number relocated from one part of the nest to another. We also measured the number of parrots present during each observation. We found that as the mating season approached, the number of sticks added, carried, and removed increased significantly (4 separate ANOVA analyses) , while the number of

sticks relocated remained unchanged. Given that monk parakeets build nests year round makes this finding suggest that there are two nest construction processes in monk parakeets.

PSY – 10 COLLECTIVE LEADERSHIP AND GROUP IDENTITY: THE ROLE OF COMMUNICATION IN MULTICULTURAL TEAMS

Lorena A. Solis (GRAD) and Jennifer Feitosa, Department of Psychology, Brooklyn College

Leaders have the capability to influence and motivate their team in order to produce positive group outcomes. However, current organizations are changing in two drastic ways that challenge what we currently know: (1) members are more culturally diverse, and (2) leadership is becoming more of a responsibility of the whole team, rather than just relying in one individual. Therefore, the current study aims to investigate if culturally diverse teams that engage in shared leadership will influence group identity through the mechanisms of communication. One hundred and fifty-two students were asked to recall and report about their experience within a culturally diverse team. More specifically, collective leadership predicted the extent to which individual's developed a group identity, but such relationship was fully mediated by the role of voice. The positive relationship between collective leadership and voice was significant regardless of levels in information sharing. With that being said, when members partake in the team's leadership they are more likely to engage in voice behavior and in turn establish a stronger group identity. These findings have a number of theoretical and practical implications, including the better understanding of underlying mechanisms as well as the shaping of future interventions (e.g., implementing a climate that encourages participation) to understand how culturally diverse teams can excel. Limitations and future research are discussed.

PSY – 11 EFFECTS OF BRAIN STIMULATION ON THE FEELING OF KNOWING

Rifat Ahmed (UN),[1] Sandry Garcia,[2] Elizabeth Chua[1]
[1] Psychology Department at Brooklyn College, Brooklyn, NY
[2] Brooklyn College, Brooklyn, NY

We previously showed that excitation of the dorsolateral prefrontal cortex (DLPFC) using HD-tDCS increases the accuracy of "feeling-of-knowing" judgments. The goal of this experiment was to replicate this finding, and also to determine if the ability of HD-tDCS over the DLPFC to improve feeling-of-knowing accuracy changed with task difficulty. Participants were tested under 3 different HD-tDCS conditions: left DLPFC, left anterior temporal lobe (ATL) stimulation, and sham stimulation. During stimulation, participants first attempted to recall the answer to a general knowledge question, then gave a feeling-of-knowing (FOK) judgment, followed by a 4 alternative forced choice recognition task. Each participant completed one block each of easy, medium, and hard questions. We first examined the effects of tDCS on FOK ratings, and showed a significant accuracy x stimulation interaction [$F(2,48)=30.926$, $p<0.001$], which was driven by higher FOK ratings for correct answers with DLPFC stimulation. This pattern was consistent across medium and hard questions. We next examined the effects of stimulation on metacognitive accuracy, as measured by da; there was better FOK accuracy during DLPFC compared to ATL and sham stimulation [$F(2,48)=16.318$, $p<0,001$], and this was consistent across medium and hard questions. These preliminary data show that HD-tDCS over the left DLPFC has effects on feeling-of-knowing judgments, and that this is consistent across different levels of difficulty.

PSY – 12 COLOR VISION, SPATIAL RESOLUTION, AND SEX

Daniel J. Chi (UN), Applied Vision Institute, Brooklyn College and Alla Chavarga, Taylan S. Ergun, Stavros P. Hadjisolomou, Kamil Kloskowski, Israel Abramov, Applied Vision Institute, Psychology Department, Brooklyn College

Human vision is based on 3 different cones types. Hecht (1949) predicted that missing one type of cone (color blindness) should improve visual acuity; he failed to confirm this. We compared measurements of color vision (Farnsworth-Munsell Hue Test-FM100), and spatial resolution (contrast sensitivity function). We found a correlation between FM100 (a measure of color discrimination) and various points on the contrast sensitivity function (a measure of detectability of coarse to fine components of a visual image) [N=21]. We also found a clear sex-related difference; worse color discrimination correlated with poorer contrast thresholds. This builds on our previous reports of sex differences in color and spatial vision (Abramov, Gordon, Feldman, and Chavarga 2012a,b).

PSY – 13 SYMMETRY AND ATTRACTIVENESS IN UN-MANIPULATED AND INVERTED FACES

Arooj Alam (UN), **Ahuva Buchbinder** (UN), Simon Stauber, Brooklyn College and Stefano Ghirlanda, Department of Psychology, Brooklyn College

Facial attractiveness is a widely researched topic in evolutionary psychology. Throughout history, people have been curious to know why we are more attracted to certain faces compared to others, and how a beautiful face affects our perception of others, as well as our behavior. The effect of facial symmetry on perceptions of attractiveness has been investigated extensively in the last decades, yet important questions remain unanswered. For example, the relationship between objective and perceived symmetry remain unexplored, and most studies seeking to understand how symmetry influences attractiveness have used computer-manipulated rather than natural faces. To better understand the relationship between attractiveness and symmetry, we are using objective measures of symmetry using facial land-marking, as well a presentation of un-manipulated faces in upright and inverted orientations. The latter aims at disrupting natural face processing to observe whether attractiveness and symmetry judgments are preserved. We present our methodology as well as preliminary reports of our ongoing work.

PSY – 14 EYE-COLOR – THE NEW PHRENOLOGY?

Taylan S. Ergun (GRAD), Alla Chavarga, Daniel J. Chi, Stavros P. Hadjisolomou, Kamil Kloskowski, Israel Abramov, Applied Vision Institute - Department of Psychology, Brooklyn College

Numerous papers have related an individual's eye-color to a variety of psychological traits – e.g., agreeableness, competitiveness, and tendency towards alcoholism (Gardiner & Jackson, 2010; Bassett & Dabbs Jr, 2001). But there is no accepted method of measuring eye-color – each study uses its own arbitrary system of categorizing the different eye-colors. We asked whether there is a clear series of objective categories. Using a scanning spectroradiometer we measured the spectral reflectance of each participant's iris across the entire visible spectrum. From this we derived: (i) albedo by summing a participant's reflectances across the spectrum; (ii) color by computing the co-ordinate values for each iris in a standard chromaticity space (CIE 1976, u' v'). A frequency distribution of albedos indicated a multimodal distribution. On the chromaticity diagram we found three clusters: the largest cluster (almost all female) followed the chromaticity distribution of black-body radiators; a distinct, separate, smaller cluster was equally male and female; the smallest cluster also follows the black-body locus, but is separate from the largest cluster. Our clusters do not correspond to the many categorical descriptions of eye color, such as brown, blue, gray, green, hazel, black (Psychologists beware!).

PSY – 15 A BIOMIMETIC NEURAL NETWORK CONTROL MODEL TO EXPLAIN MANDIBULAR OBJECT GRIPPING IN ANTS AND ROBOTS

Jeremy Brown (UN), Baruch College, CUNY and Frank W. Grasso, BCR Lab, Department of Psychology, Brooklyn College, The Graduate Center at CUNY

Evolution has invented different means of dexterous manipulation across the animal kingdom (e.g., in cephalopods, vertebrates, and arthropods). Ants, which are arthropods, perform both precise and (relatively) high-force manipulations with their mandibles (e.g., brood/egg manipulation and food transport from forage sites to the nest). However, their dexterous manipulation control systems have been less studied than those of other animals. Ant mandibles are moved by opposing slow and fast, opener and closer muscles (4 types on each mandible) that have been anatomically well-characterized. We hypothesized that during gripping closer muscles act in opposition to the opener muscles and that the opener muscle action was modulated by sensory input from the mandibles (anatomically described contact-sensitive sensible). We designed and implemented an artificial neural network that embodies these aspects of mandibular control in the ant common carpenter ant Camponotus rufipes. We assumed a command neuron to signal closing and modeled left and right mandibular sensory input. The network included 3 input neurons (command, left and right mandibular sensor), one bias unit, 5 interneurons representing known identified neurons in the ant brain and four motor neurons. This network qualitatively reproduced mandibular opening in closing in the ant. This artificial neural network is also suitable for use as a controller of robotic mandibles. Ongoing work includes quantitative analysis of simulation results with specific comparisons to ant neural control of mandible movements and their angular velocities and implantation into Lynx-motion hexapod robot.

PSY – 16 AVOIDANCE LEARNING IN THE FIDDLER CRAB, UCA PUGILATOR

Stephen G. Volz (GRAD) and Frank W. Grasso, Department of Psychology, Brooklyn College

Fiddler crabs' innate burrow homing behavior makes them a natural subject for studies of invertebrate spatial memory. Since most evidence is from field studies one goal of our project is to develop and validate methods for studying spatial learning in fiddler crabs under controlled lab conditions. We hypothesize that this burrow-homing ability extends to a generalized spatial memory ability. To that end we have developed a new method for implanting electrodes in the gills of fiddler crabs, through which we can deliver electric shocks to freely behaving animals. We developed a new arena to study crab spatial memory in a place learning paradigm. In this a crab is free to explore and electric shock is administered when the animal enters an experimenter determined region of the arena. We present results from 2 studies using this paradigm, which demonstrate that both our US (shock) and our CS (visual patterned stimuli) are perceivable by fiddler crabs. Experiment 1 provided evidence that fiddler crabs successfully escape, but do not avoid shock ($F(1,20)=245.4$ $p<.05$, $F(3,60)=4.416$ $p<.05$). Experiment 2 provided evidence that fiddler crabs prefer moving toward checkerboard patterns, regardless of that pattern's training history on all 6 days of the experiment (single sample t tests, largest p value = 0.023). Currently, we have no found any evidence of fiddler crabs forming an association between these stimuli, suggesting that these animals may rely on instinctual mechanisms to avoid aversive stimuli, as opposed to a general, plastic spatial learning mechanism.

PSY – 17 THE EFFECTS OF CUE FAMILIARITY ON THE FEELING-OF-KNOWING

Janai R. Williams (UN), Department of Psychology, Brooklyn College and Lua Koenig, and Elizabeth Chua, Department of Psychology, Brooklyn College and The Graduate Center, The City University of New York

When people fail to remember something, they may experience a "feeling-of-knowing", in which the information is in their memory and could be remembered at a later time. This "feeling-of-knowing" (FOK) may be based, in part, on how familiar a cue is. Previous research has shown that increasing cue familiarity leads to higher FOK ratings, without a corresponding increase in recognition accuracy. To pilot for a brain stimulation study, we attempted to replicate this effect using a face-name associative memory task. First, participants (n=17) studied 60 faces three times each.   Next, they studied 120 faces paired with first names, half of which had been previously studied. At test, participants were shown a face and asked to recall the name. This was followed by a FOK judgment, and then a recognition task. First, we examined the effect of face familiarization on FOK ratings, and found that there were higher FOK ratings for the familiarized face condition compared to the non-familiarized face condition [$F_{(1,16)}$ =15.87, $p<0.001$]. We next examined the effect of face familiarization on recognition accuracy, and memory performance was better for more familiar vs. less familiar faces, for both recalled names [$t(16)=2.67$, $p<0.02$] and recognized names [$t(16)=2.67$, $p<0.02$]. Finally, we examined the accuracy of the FOK judgments, in other words how well FOK judgments correlated with recognition, and paired t-tests showed no difference in FOK accuracy based on face familiarity [$t(16)=0.77$, $p>0.45$].   Unlike previous studies which showed no impact of cue familiarity on recognition accuracy, our results showed increased FOKs and increased recognition with higher cue familiarity. This indicates that additional piloting is needed before we begin a brain stimulation study.

PSY – 18 DOES CHEMO-TACTILE SENSORY DISCRIMINATION ABILITY INFLUENCE SPACE USE IN THE FIDDLER CRAB UCA PUGILATOR?

Arthur Golub (UN), Stephen G. Volz and Frank W. Grasso, BCR Lab, Department of Psychology, Brooklyn College, The Graduate Center at CUNY

The ecology, phylogeny and innate burrow-homing behavior of fiddler crabs suggest they could possess generalized spatial memory ability. Previous research showed that arthropods including crustaceans such as lobsters, shore crabs, and fiddler crabs, use chemoreceptors on their feet for chemo-tactile (touch-taste) object discrimination. We hypothesized that fiddler crabs use chemo-tactile ability to support spatial memory. As a first step towards this we designed an arena with three regions: a brackish water region (66% of the arena); a food-flavored sand region (17%); and non-flavored sand region (17%). We measured the time crabs spent in each region over a 24-hour period. The animals (n=13) varied widely but unsystematically in their use of the dry and wet regions. We found significant differences in the proportion of time the crabs spent in the flavored versus non-flavored region $t(12) = 2.21$, $p=0.047$. Contrary to our predictions the crabs spent significantly more time on the non-flavored region. This suggests that the animals found the flavored side somehow aversive. We conclude that fiddler crabs can sense the difference between these two regions in a way that influences their use of space. This demonstration is a foundation for studies exploring putative spatial memory processes in fiddler crabs.

PSY – 19 DO EYES ACTIVATE PHYSIOLOGICAL AROUSAL IN INDIVIDUALS WITH PSYCHOPATHIC TRAITS?
Gcinokuhle Azanda Mkhwanazi (UN), Department Of Psychology, REU Brooklyn College

For years deficits in emotion recognition and processing have long been thought to be strongly associated with impaired recognition of distress cues and the dysfunction of the amygdala which is the region of the brain that is involved in emotional behavior, emotion processing, and learning processes. Numerous studies have demonstrated a hyposensitivity to faces expressing fear and other expressions in individuals with high psychopathy traits. Though there is no doubt that these components contribute to our understanding of psychopathic behavior, none of the studies has focused solely on the physiological measures to explain what happens during an empathy evoking event in psychopaths. Supported by REU

PSY – 20 A PHYLOGENETIC ANALYSIS OF SPATIAL MEMORY IN FRESHWATER CRUSTACEANS
Flora Muslumova (UN), BCR Lab, Department of Psychology, Brooklyn College and Frank W. Grasso, BCR Lab, Department of Psychology, Brooklyn College, The Graduate Center at CUNY

Crayfishes are a successful and diverse taxonomic group with world-wide distribution, intensely studied for their behavior and neurobiology. Studies of their spatial memory capacity indicate several evolutionary innovations and losses. Learning the distribution of spatial memory across these species will aid understanding the ecological fit of memory ability to environmental demands. Through a literature search on 191 species, we accumulated quantitative values of 11 attributes related to spatial memory for 27 species of crayfish from 9 genera: Cherax, Pacifastacus, Astacus, Austropotamobius, Procambarus, Cambarellus, Barbicambarus. Orconectes, Cambarus. Cluster analysis using these attributes divided these 27 species into 5 classes, which were rank-ordered based on their degree of suitability for spatial memory. We mapped these five classes onto a published molecular phylogeny to study the relative evolutionary relationships between these species. We found the ancestral state of our crayfish species showed heavy reliance on correlates of spatial memory. These correlates were lost for some sub-taxa; they (particularly burrowing behavior) reappeared in some derived species, indicating reinvention. A heterogeneity index was used to identify taxa with strong gradients of spatial ability. The genera Procambarus and Orconectes are the best candidates for comparative studies of the mechanisms and evolution of spatial memory in crayfishes.

PSY – 21 LEARNING ASSOCIATED MODULATION OF PSD95 PROTEIN EXPRESSION IN THE MOUSE HIPPOCAMPUS
Joey Bukai (UN),[1] Joelle Chorny (UN),[1] Sauly M. Betesh,[2] Kunal Khanna,[3] Rudolf Abdelmessih,[4] Juan M. Alarcon[3]
[1] Department of Psychology, Brooklyn College
[2] Department of Biology, Brooklyn College
[3] Department of Pathology, SUNY Downstate Medical Center
[4] Department of Chemistry, Brooklyn College

Memory is crucial for the survival of most organisms. Neuroscience research has led to the formulation of the Synaptic Plasticity Hypothesis of Memory, which posits that memory acquisition changes synaptic connections between neurons to store memory. This hypothesis predicts that distinct memory experiences would be encoded across particular synaptic circuits. However, the identification of particular changes in synaptic circuits associated with specific learned experiences remains a challenging task. This study seeks to investigate how learning experiences change the molecular profile of synaptic circuits in the mouse brain. To accomplish this, brain slices from mice that underwent different memory

training in an Active Place Avoidance (APA) task, along with control and untrained mice, were analyzed using immunohistochemical and confocal imaging methods to characterize the expression of PSD-95, a synaptic protein that plays a major role in synaptic plasticity - in the CA1 region of the hippocampus. It was hypothesized that there would be a direct, linear correlation between the demand of the spatial task and degree of PSD-95 expression observed. Unexpectedly, the findings show a non-linear correlation between memory training and PSD-95 expression - suggesting a dynamic synaptic process for representing a learned experience. Such a dynamic process may be reminiscent of an Attractor System, where the organization of synaptic connectivity is condensed into a specific pattern to efficiently store information. The goal of this study is to advance the contemporary understanding of the mechanisms by which memories are formed, stored, and utilized.

PSY – 22 CAN VS. WILL: ATTEMPTS TO CONCEPTUALLY AND EMPIRICALLY DISENTANGLE SELF-EFFICACY FROM THE INFLUENCE OF OUTCOME EXPECTANCY IN LOW-PERFORMING UNDERGRADUATE PSYCHOLOGY STATISTICS STUDENTS

Rose E. Bergdoll (UN),[1,2] Angie P. Cuervo,[1,2] Laura A. Rabin[2]
[1] NSF Neuroscience REU
[2] Department of Psychology, Brooklyn College

Introductory statistics is often considered one of the most crucial and arduous courses required for a bachelor's degree in psychology. Numerous student characteristics have been examined in relation to academic success, among them, academic self-efficacy and outcome expectancy predict achievement in various academic subjects, including statistics. The present study measured self-efficacy and outcome expectancy for learning and achievement in statistics over the course of a 15-week semester in 169 undergraduate students enrolled in an introductory course, with a particular interest in changes according to the performance level of the students. Based on Albert Bandura's self-efficacy theory, we postulated that self-efficacy would differ from and determine outcome expectancy in students. We also anticipated an increase in statistics self-efficacy in all students, as course materials and statistical concepts became more familiar, facilitating higher outcome expectancies. Results indicated a significant loss of self-efficacy in students who performed poorly on in-class exams while outcome expectancy was related to lab quiz scores, procrastination, and year in college. Additionally, non-white students possessed considerably higher self-efficacy for mastering the course material than white students, although no differences in outcome expectancy were observed.

PSY – 23 MULTINATIONAL TEAMS: CULTURAL AND CONTEXTUAL INFLUENCES

Joshua Silnik (UN), Jennifer Feitosa, Department of Psychology, Brooklyn College

Diversity in the workplace is on the rise which means businesses are more likely to branch out to multiple nations for its workforce. These organizations are called multinational enterprises (MNEs), and they have specific challenges related to their cultural diverse nature that can influence work performance. From a multi-level perspective, this study aims to integrate how cultural dimensions influence satisfaction, motivation, and more importantly performance. After reviewing over 60 articles on MNEs, a framework and propositions were extracted to synthesize the trends in the current literature. First, diversity in regards to collectivism and individualism negatively affect satisfaction, motivation, and adjustment in multinational enterprises. Second, diversity in power distance -how inequality in the culture is viewed- showed a similar trend, but also leading to a negative relationship to the more distal outcome, performance. Third, cultural distance -degree of difference between norms of different cultures- and ethnocentrism -belief that one's culture is superior to others- moderated the

aforementioned relationship, such that high levels of these variables led to stronger and more detrimental relationships.   This review provides a number of theoretical contribution (e.g., understanding the underlying mechanisms in which cultural differences affect MNE's performance) as well as practical implications (e.g., organizations should be giving proper consideration of employees' cultural values prior to assigning them to work abroad). Limitations and future research will be discussed.

PSY – 24 EVIDENCE OF VISUAL PATTERN TAXIS IN FIDDLER CRABS UCA PUGILATOR

Ahuva Buchbinder (UN),[1] Frank W. Grasso,[2] Stephen G. Volz[2]
[1] BCR Lab, Department of Psychology, Brooklyn College
[2] BCR Lab, Department of Psychology, Brooklyn College, The Graduate Center at CUNY

Fiddler crabs are widely known to be excellent navigators, but to what extent they use visual cues as they navigate from their home burrow on foraging trips is an open question. We hypothesized that fiddler crabs are sensitive to visual spatial cues, as they have an elaborate visual system, and a plethora of visual cues available in their environment. This question is of interest to comparative psychology because fiddler crabs and mammals diverged long ago. If fiddler crabs are able to navigate using visual cues, it would suggest that this is a case of convergent evolution. We placed fiddler crabs in a checkerboard walled environment and allowed them to explore for 10 minutes. We then switched the crabs to a black walled environment for 10 minutes and administered electric shock every 30 seconds. After four rounds of this treatment, we presented crabs with a choice between the black area and the checkerboard area and administered a single shock. If the crabs formed an association between wall patterns and electric shocks, they would flee toward the environment that had not been paired with shock. What we found was that fiddler crabs did not form an association between wall pattern and shock, which means that they did not associate the available visual cues with the experience of shock. However, we did find that fiddler crabs prefer to be in a checkerboard environment versus a black environment, suggesting that fiddler crabs are able to discriminate between our two visual stimuli (single sample t-test, against a mean of 0.5 $t(53) = 37.42$ $p \ll 0.001$). The findings suggest that fiddler crabs may employ a rigid non associative strategy in avoid aversive stimuli.

PSY – 25 MANAGING MULTINATIONAL TEAMS: INSTITUTIONAL, CULTURAL, AND CONTEXTUAL INFLUENCES

Theresa Aristomene (GRAD) and Jennifer Feitosa, Department of Psychology, Brooklyn College

Over 63,000 multinational enterprises directly employ 90 million people around the world (Gabel & Brunner, 2003). With such diversity, a number of novel challenges and needs arise. The literature has an amalgam of theories and guidelines regarding the role of diversity in the workplace, but little has been done to integrate and provide tangible best practices to improve current Human Resources Management (HRM) practices within this global context. To address this gap, this paper draws from the current literature to provide scientifically-grounded guidelines that can be readily implemented in multinational organizations. First, we focus on parsing out the role of structural and demographic diversity to team performance. Second, we highlight the construct of collective efficacy as an explanatory mechanism in which diversity will influence performance. Third, HRM practices are created along with a checklist to serve as a practical tool. Last but not least, other theoretical and practical implications are discussed. This article reviews relevant literature to develop propositions by forming a model of team performance within multinational companies. Consistent with the current literature, there remains conflicting ideas on how diversity affects the workplace, especially in a global workforce. First, we examine the varied definitions of diversity, both demographic and structural. We then explore

theoretical foundations for our constructs focusing on how the collective efficacy of a team mediates the diversity - performance relationship in multinational companies. We also propose how the role of HRM practices is a moderator to this relationship.

PSY – 26 REDUCED SELF-EFFICACY IN LOW PERFORMING UNDERGRADUATE STUDENTS RELATES TO SPECIFIC ACADEMIC TASKS

Angie Cuervo (UN), Rose Bergdoll, Beliz Hazan, Laura Rabin, Department of Psychology, Brooklyn College

An introductory course in statistics is an important requirement for undergraduate students in psychology and related fields as well as a prerequisite for graduate school. Self-efficacy refers to judgments of one's ability to accomplish tasks and succeed in various activities. Based on Albert Bandura's theory, which states that self-efficacy is domain specific, we developed a tool to measure and further categorize self-efficacy judgments in order to identify components related to statistics course performance. Participants were 525 undergraduate students enrolled in a psychology statistics course at Brooklyn College. Over the course of five 15-week semesters, students completed a 35 item self-report survey to evaluate their academic self-efficacy for this course. Students were then arranged into high or low performing groups based on exam grades. Students with exam grades below 80 (low performing) reported lower self-efficacy on items related to solving complex problems and working independently. These items were also significantly correlated with overall course grade ($p<.05$). These results are important because a lack of self-efficacy in statistics prevents many students from engaging in research and related activities that that would further their academic and professional careers. Furthermore, raising students' self-efficacy for specific academic tasks could lead to better performance outcomes.

PSY – 27 OUTGROUP BIAS: WOULD THAT BE THE DARK SIDE OF RELIGIOUS IDENTITY?

Reggie Romain (GRAD), **Keziah Edmunds** (UN), Brooklyn College and Jennifer Feitosa, Department of Psychology, Brooklyn College

Religious organizations are one of the most influential groups individuals can participate in. These organizations can be an integral part of shaping one's social identity (Lim & Putnam, 2010). On the one hand, such religious identity strength may help the formation of a supportive social network. On the other hand, high levels of religious identity and commitment can lead to an overlook of outgroup members, resulting in outgroup bias. Although researchers have found theoretical links for such arguments, little evidence has been found as to how religious affiliations play a key role in one's social identity and interactions. To address this gap, this study investigates how one's religious identity influences outgroup bias through both network support and commitment to the organization in addition to the moderating role of openness to experience. Initial data collection from individuals belonging to either a church or a mosque (N= 51) revealed important findings. Through the use of social network analysis, our results indicate that religious identity is significantly related to an individual's commitment to the group, but not necessarily to the strength of their social network. These relationships seemed to generalize across different levels of openness to new experiences. However, one's commitment and social network support was not significantly related to outgroup biases. The implications of this research highlight the importance of understanding one's religious identity as a precursor of his/her commitment to an organization, while the relationships with social network support and outgroup bias are more complex than expected. Limitations and future research proposals will be discussed.

PSY – 28 HOW ENGAGEMENT AND PERCEIVED CONTROL IMPACT OVERALL HEALTH QUALITY

Kayla M. Talbot (UN), John Jay College of Criminal Justice and Dr. Jacob Shane, Department of Psychology, Brooklyn College

As individuals age they encounter an increasing number of health problems. How individuals choose to engage or disengage with their health problems, the perceived control of their health problems, and the effect that this engagement/disengagement has on their overall health quality is an interesting relationship to observe. The present research stems from the Motivational Theory of Life-Span Development and the Lines-of-Defense Model for managing health threats. Data from the Midlife in the United States National Longitudinal Study of Health and Well-Being are analyzed using multilevel modeling in order to examine the changes in: 1) engagement with health, 2) overall health quality, 3) perceived control over health, and 4) expected future health quality. In addition, the current study examines how 5) engagement with health and perceived control over health effects present and expected future health quality (overall health quality). We hypothesized and found that: 1) engagement with health increases across adulthood, 2) overall health quality declines across adulthood, 3) perceived control over health declines across adulthood, 4) expected future health quality declines across adulthood, and that 5) that the most positive overall health quality results from high engagement with health in combination with high perceived control over health, whereas the most negative overall health quality results from low engagement with health in combination with low perceived control over health. These findings have applications in healthcare, indicating that while control over health situation is the strongest predictor of overall health quality, engagement in one's health also significantly influences overall health quality.

PSY – 29 PROCESSING TIME OF INCREMENTAL GROUPING FOR SHAPE PAIRS

Tara Fitzgerald (UN), Department of Psychology, Brooklyn College

A visual scene is comprised of contour elements that are first encoded by individual neurons within primary visual cortex (V1). Specialized neurons code for specific feature combinations. The feature specificity of V1 neurons initiates a quick feed forward response across the visual system. Following initial encoding of stimulus components, a second mechanism is required to appropriate feature combinations. This form of integration proceeds as incremental grouping, which is comprised of feedback and horizontal connections within primary visual cortex. Higher cortical areas send information back to cells within V1, enhancing their firing rate. Feedback from higher areas takes more time, increasing the duration of secondary processing. In order to examine the time course of incremental grouping we operantly conditioned rats to discriminate between simple stimuli comprised of horizontal or vertical lines. We then introduced more complex stimuli comprised of shape pairs that could be perceptually grouped as either horizontal or vertical patterns. We hypothesized that performance would improve with longer reaction time, in which incremental grouping of stimulus form is allowed to proceed to completion.

PSY – 30 SEX DIFFERENCES IN FACIAL AFFECT RECOGNITION AND PSYCHIATRIC SYMPTOMS IN THE GENERAL POPULATION AND INDIVIDUALS AT PSYCHOMETRIC-RISK FOR PSYCHOSIS

Anastasia Pluish (UN), Deborah Walder, Department of Psychology, Brooklyn College

Facial affect recognition (FAR) deficits are well-established in psychosis, and may contribute to poor social functioning in psychosis. FAR tasks are often incorporated into social cognition remediation programs, potentially benefiting social functioning. Despite well-documented sex differences in FAR

performance in the general population (e.g., better FAR accuracy among females than males), results are mixed for psychosis high-risk and psychotic populations. There is also evidence of sex differences in psychotic symptoms in clinical and high-risk populations. Sex differences in the relationships among these variables remains relatively understudied in non-clinical and high-risk samples. To address these gaps in the literature, the current study hypothesized (based on prior literature) greater FAR accuracy and lower disorganized and negative (not positive) symptoms among females compared to males in the total sample. Among individuals at psychometric high-risk for psychosis, we hypothesized lower disorganized (and negative symptoms among females, with no sex differences in FAR performance. Measures of schizotypal traits and FAR performance were administered to 850 adults ages 18-34 years. In the total sample, disorganized symptoms were lower, whereas FAR accuracy was higher, among females. Among high-risk individuals, no sex differences were found in FAR performance nor disorganized symptoms. Potential sex differences in the association of FAR performance with schizotypal symptoms also will be examined. Results support the need to consider sex differences in FAR and schizotypal symptoms when studying non-clinical samples and individuals at high-risk for psychosis, with potential implications for sexually differentiated use of social cognitive remediation programs.
Supported by REU - NSF

SCAS – 1 COLORING VS. DRAWING: EFFECTS OF COGNITIVE DEMAND ON MOOD REPAIR, FLOW AND ENJOYMENT

Jennifer Forkosh (UN), Psychology Department at Brooklyn College, Brooklyn, NY

Previous research has demonstrated that using drawing as a form of distraction leads to greater mood improvement than drawing as a form of expression. This may be attributed to the greater cognitive demand imposed by distraction tasks. This study assessed whether a distraction task higher in cognitive demand leads to greater mood repair and flow than a distraction task lower in cognitive demand. After inducing a sad mood by asking participants to recall their saddest experience, 60 participants were randomly assigned to one of three conditions: coloring book (low cognitive demand), design (high cognitive demand), and express. Both the coloring book and design conditions incorporated distraction, while the express was used as a control condition. Participants in the coloring book condition were instructed to color in a pre-drawn mandala design while those in the design condition were asked to draw a non-representational item. Participants in the express condition were asked to draw about the sad event they had recalled. Positive affect and negative affect were assessed before and after the mood induction and after the drawing activity. Participants in the coloring book and design conditions experienced greater mood repair and enjoyment than those in the express condition. Participants in the coloring book condition experienced greater overall flow than those in both the design and express conditions. Thus, distraction is more effective than expression at repairing mood. While both distraction tasks (regardless of level of cognitive demand) led to greater mood repair, the low cognitive demand task resulted in greater states of flow.

BIO – 1 OPTOGENETIC INVESTIGATION OF NEISSERIA SPECIES MOTILITY DURING THE FORMATION OF MICROCOLONIES

Ioannis Eugenis (UN),[1] Nicolas Biais,[1] and Kevin H. Gardner[2]
[1] Department of Biology, Brooklyn College, Brooklyn, NY
[2] CUNY Advanced Research Science Center

Bacterial motility plays an important role in the attachment to and colonization of a host. However, the twitching motility of bacteria caused by the retraction of their Type IV pili is an understudied biological phenomenon. Here, an optogenetic system was cloned into the genomes of both Neisseria gonorrhoeae and Neisseria elongata to study their motility and to assay the role of bacterial movement during the formation of microcolonies, the precursors to biofilms. Optogenetics, a technique commonly used in neurons to regulate the expression of genes with light, was applied to bacteria in this experiment. Using this method, pilT, an ATPase motor protein responsible for the retraction of pili and thus the twitching motility, was put under the control of a promoter responding to blue light. Gibson Assembly, a molecular tool that allows for the joining of DNA fragments, was used to create DNA constructs containing the genes encoding pilT and EL222, a light-sensitive protein that binds to a specific sequence of DNA and allows for the transcription of downstream genes. This tool allows for the precise spatial and temporal control of the motility behavior of the bacteria upon the activation of the pilT gene. The optogenetic control of pilT, and thus of the twitching motility, in N. gonorrhoeae and N. elongata also allows for the measurement of the dynamics of pili turnover.

BIO – 2 THE PHYSICAL CHEMICAL WARFARE BETWEEN S. MUTANS AND S. SANGUINIS

Urooj Ansari (HS),[1] Nicolas Biais[2]
[1] Midwood High School, Brooklyn, NY.
[2] Brooklyn College, Brooklyn, NY

Streptococcus mutans &Streptococcus sanguinis are two bacteria that compete for tooth surface. S.mutans causes cavities and S.sanguinis causes no harm. This study was done to determine which bacteria better withstands changes in the environment and which is stronger. According to literature, different chain lengths can create inconsistencies in the results. To prevent that, all chains were made smaller. Both bacteria secrete chemicals for continuity and as defense.S.mutans releases lactic acid and S.sanguinis releases ammonia. Since the pH of the mouth fluctuates, the bacteria were grown in plates with pH's of 5,7, and 8.S.mutans grew in all 3 while S.sanguinis didn't grow in the acidic plate. In conclusion, S.mutans is resistant to alkalinity and S.sanguinis is intolerant to acidity. S.sanguinis colonizes the mouth before S.mutans. To observe the effect of time, bacteria were spotted at different times. S.mutans was able to grow at all times while S.sanguinis didn't grow in the acidic nor neutral plate. It was concluded that S.mutans released lactic acid, making the neutral plate acidic, preventing growth. S.sanguinis has a twitching motility enabled by motor protein pilT. To observe the significance of pilT, WT S.mutans was grown with S.sanguinis ΔpilT.Fewer colonies were visible when the wild types of both were placed together, indicating physical combat. Without the pilT,S.sanguinis has no physical defense mechanism. Nutrient availability fluctuates inside the mouth. To observe the effects on the bacteria, both were grown in 2mL of Todd Hewitt. The greatest increase was seen when both were placed together. This indicates when overeating, we also overfeed our bacteria. It was concluded that S.mutans is better able to withstand changes in the mouth, and compared to S.sanguinis, it is stronger.

BIO – 3 PATERNAL INVESTMENT IN MALE- PREGNANT PIPEFISH SYNGNATHUS FUSCUS

Emily Hui (HS),[1] Frieda Benun,[2] Dr. Tony Wilson[2]
[1] Midwood High School, Brooklyn, NY
[2] Brooklyn College, Brooklyn, NY

The knowledge of paternal investment is largely unknown throughout the animal kingdom. In most species, fathers play no role in post-zygotic care for their offsprings after they have mated with a female. However, in the family Syngnathidae which consist of seahorses, pipefish, and seadragons, there is a unique mating system where the males have brood pouches catered to provide all the post-zygotic care but to what extent? We were able to determine the level of paternal investment from Syngnathus fuscus males to their offsprings through the use of the patrotrophy index (PI). Both groups displayed a negative slope, indicating egg size decreases across male pregnancy but our analysis proved otherwise. The PI values were ranged from 0.7-0.9 resulting in different levels of investment from both groups, thus there was a change in investment. However the PI values calculated were lower than 1 in both groups, thus this species is lecithotrophic and there may have been a change in paternal investment as the mating season progressed.

BIO – 4 ADRENERGIC ACTIVATION MODULATES EXTRACELLULAR DIFFUSION OF MACROMOLECULES IN MOUSE VISUAL CORTEX

Jiddu Guart (UN)[1] and Eglontina Siminca[2]
[1] Biology Department, Brooklyn College
[2] Brooklyn College, Brooklyn, NY

Brain extracellular space (ECS), the narrow channels separating cells, is essential for the distribution of neurotransmitters, nutrients, and therapeutics. Due to a lack of active transport, diffusion is the primary mode of transport in the ECS. Hindrance to macromolecules (e.g., dextran, 3 kD) diffusing in brain ECS is quantified as tortuosity (λdex). Research from our lab has shown that λdex increased during adrenergic system activation, both with isoprenaline (β agonist), & a mix of phenylephrine & clonidine ($\alpha1$&$\alpha2$ agonists). Here we hypothesize: 1)whether coactivation of $\alpha1$, $\alpha2$ and β will increase λdex in an additive fashion, and 2)whether activation of $\alpha1$ alone, but not $\alpha2$, will increase λdex, due to $\alpha1$'s stimulatory action and $\alpha2$'s inhibitory action of their respective signal transduction pathways. Integrative Optical Imaging (IOI), a method involving the pressure injection of fluorescently labeled dextran into male & female mice visual cortex, was used to quantify λdex. Under control conditions, no significant difference in λdex between males (1.68 ± 0.19, mean ± SD, n(records) =15, N (mice) =7) and females (1.75 ± 0.23, n=11, N=5; t-test, p=0.36) was measured. Applying a mix of $\alpha1$,$\alpha2$,and β agonists resulted in λdex = 2.00 (n=3, N=1). Applying $\alpha1$ alone resulted in λdex = 2.30 (n=3, N=1). Data on the adrenergic agonists are preliminary. Future experiments will gather more data, including the possibility of an inhibitory effect of $\alpha2$ implied by $\alpha1$ (λdex = 2.30) > $\alpha1$+$\alpha2$ (λdex = 1.81). We found that hindrance to macromolecules significantly increased during activation of adrenergic system. Since the adrenergic system is known to be more active in the wake vs sleep state, our findings have implications in macromolecular diffusion and drug delivery in these two states.

BIO – 5 LOCATION DEPENDENT PROPERTIES OF LTP AND LTD –LIKE SYNAPTIC ACTIVITY ON ACTION POTENTIAL GENERATION ASSAYED IN NEURON

Michelle Do (HS), Midwood High School, Brooklyn, NY

Neuroscientists aim to unlock the mysteries of how the brain works. One of such mysteries is how the brain encodes and decodes information. Information flows among networks of neurons as electrical

signals called action potentials. Action potentials arrive at synapses, the connections between neurons. There, synaptic activation modulates the generation of a new action potential, in the adjacent neuron which will move along the neural network. Understanding how synapse activation modulates the formation of action potentials is an important step in deciphering information processing. In my study, I used the NEURON simulation software to characterize how distinct synaptic activities arriving at two separate synaptic connections of a neuron combine and modulate the generation of an action potential. Neurons in the brain receive a multitude of information at their many synaptic connections; my goal is to decipher how different types of information may be integrated and help increase our understanding of processing of information in the brain. My research goal was to help with an understanding of how neurons handle information and how they integrate multiple inputs of information, the foundational mechanism for high brain function, including cognition. Through my research, it was noticed that there were modulations between the independent LTP and combined LTP/LTD as the LTP-like input was modulated by the LTD like input. The output/ electrical signal of the LTP- like input sent out after combining with LTD- like input was modified.

BIO – 6 STIMULATING THE TBR1/CASK PROTEIN INTERFACE TO UNDERSTAND RISK FOR AUTISM SPECTRUM DISORDER
        Sana Ilyas (HS), Midwood High School, Brooklyn, NY

Autism Spectrum Disorder (ASD) is the fastest-growing developmental disorder in the United States. ASD is a complex of neurodevelopment disorders characterized by impairments in speech and language, and social interactions (Pruitt, 2013). ASD risk is a heritable complex trait and is extremely difficult to understand using traditional genetic studies. However, a recent study has highlighted six candidate genes that may account for up to 1% of sporadic cases of ASD (Deriziotis, 2014). One of these genes is TBR1, which interacts with the CASK gene to regulate neuron and language development (Bairoch, 2006). To better understand the protein-protein interaction between the TBR1 and CASK proteins, molecular models were constructed of each individual protein and their binding interface. The binding model predicts the T-box domain of TBR1 binds along a helix in the guanylate kinase domain of CASK. Understanding how individuals' mutations affect ASD development drugs may allow for better treatment of ASD symptoms and customize therapeutic strategies for personalized medicine.

BIO – 7 EFFECTS OF MULTIPLE-EPISODE NEONATAL SEVOFLURANE TREATMENT ON ADULT BEHAVIOR
        Matthew Chung (HS), Midwood High School, Brooklyn, NY

The most common anesthetic, Sevoflurane shows a correlation between early treatment during the brain's critical age and the formation of social deficits later on in life. We have conducted a series of behavioral tests in which we have obtained data which shows significant differences between the control and sevoflurane mice. The test that returned the biggest difference is in the 3- chamber test. This showed that the sevoflurane mice were significantly less socially interactive than the control groups meaning that due to the early treatment there was a deficit in social interaction.

BIO – 8 THE MECHANISM OF HYDRALAZINE AND QUINIDINE ON DRUG INDUCED LUPUS
        Shang Lee (HS), Midwood High School at Brooklyn College

Drug induced lupus can be caused by 46 different medications, however it is rare and very little facts about it is known. This laboratory is attempting to understand the possible mechanisms by which hydralazine and quinidine can induce a lupus-like disease. Lupus is an autoimmune disease in which the body turns the immune system against its self. To understand the mechanics, spectrophotometer was

used to determine the chemical changes caused by hydralazine and quinidine. The methods were to set up three trials of test tubes with hydralazine, quinidine, and control. All the three trials will have DTNB and cystein amongst them to have a yellow indicator. Also test tube will have a 6 mL of distilled water and diluted with 50λ of hypochlorite. The test tubes will be read in the spectrophotometer to indicate the change of reaction. The three trials will then be compared. The results support a claim that hydralazine had the fastest amount of change amongst the three trials. There is an attempt to understand the mechanism of the drugs to inspire our bodies to be diagnosed with drug induced lupus. So the conclusion is that patients who take hydralazine will have a greater risk of getting drug induce lupus than patients who take quinidine because of the specific mechanism in the drug that causes the immune system to change.

BIO – 9 THE ROLE OF VITAMIN D IN NEISSERIA GONORRHOEAE INFECTION IN HUMAN EPITHELIAL CELLS

Leutrim Cahani (HS),[1] Nicolas Biais,[2] Luis C. Santos[3]
[1] Midwood High School, Brooklyn, NY
[2] Department of Biology, Brooklyn College, Brooklyn, NY
[3] Mount Sinai Hospital

Over the past few decades, prevalence of the sexually transmitted disease gonorrhea, caused by Neisseria gonorrhoeae infection, has increased. In turn, widespread antibiotic prescription for gonorrhea has led to the resurgence of antibiotic-resistant N. gonorrhoeae strains. Thus, controlling the advance of this pandemic is increasingly difficult, making it urgent to develop alternative therapeutics. Vitamin D has recently been shown to play a role in gonorrhea infection as a powerful antimicrobial organic molecule with potential immunological and therapeutic effects. Our aim here is to further understand the role of Vitamin D as a potential therapeutic for N. gonorrhoeae infection in human epithelial cells. Specifically, we want to understand how the cytoskeleton controls N. gonorrhoeae infection with and without Vitamin D. Here we show that pre-treatment of human cells with Vitamin D can lead to lower N. gonorrhoeae infection by inhibiting the actin cytoskeleton. Significant statistical correlations are shown here. We propose further studies to elucidate the role of Vitamin D in N. gonorrhoeae infection in human cells.

BIO – 10 ANALYSIS OF THE C2 DOMAIN FOUND IN THE N-TERMINAL END OF AMOEBA PROTEUS' PLCS
Daniel Guobadia (HS), Midwood High School, Brooklyn, NY

PH domains serve as the membrane binding agent for phospholipase Cs. The purpose of this experiment was to investigate whether a C2 domain can carry out the same function as a PH domain if a phospholipase C has no PH domain. A phospholipase would be virtually useless if it could not bind to the membrane. That is why it's essential that another domain carries out its job if an organism has no PH in its PLCs. This project attempts to prove that that domain is the C2 domain for Amoeba Proteus. I worked under the supervision of my mentor Dr. Shaneen Singh in a bioinformatics lab at Brooklyn College. However, most of the experimentation was done independently, at my house, using my own personal computer. To conduct this experiment, I used a series of databases and programs to find the amino acid sequence, secondary structure, and model the tertiary structure of the C2 domain of Amoeba Proteus. Next, I determined the best tertiary structure produced by the various programs using separate verify programs. The model with the best score, the Robetta model, was used for the next step. I found the electrostatics of that model and the model of a typical PH domain using the program Pymol. I then compared the electrostatics of the two domains. The electrostatics shows where the domain is positively and negatively charged. The red areas are positively charged, while the blue areas are

negatively charged. Finally, I was tasked with finding the binding pocket and determining whether it was positively or negatively charged. Since the phospholipid membrane is negatively charged, the binding pocket must be positively charged. The results of this experiment shows that the C2 domain in the N-terminal end is, in fact, the membrane binding agent in the absence of the PH domain.

BIO – 11 ROLE OF NUCLEOLIN PHOSPHORYLATION IN THE PROGRESSION OF CELLULAR RESPONSE TO DNA DAMAGE

Jingyuan Wang (GRAD),[1] Shu Xiao,[2] Amna Aslam,[3] Anjana Saxena[1]
[1] Department of Biology, Brooklyn College CUNY
[2] Department of Biology, Brooklyn College CUNY, The Graduate Center, CUNY
[3] Midwood High School, Brooklyn, NY

The nucleolin (NCL) phosphorylation regulates several biological processes including cell cycle arrest, cell proliferation and DNA damage response (DDR). NCL-expression levels are often high in variety of tumors. Earlier studies from our lab demonstrated that the N-terminus of NCL interacts with Hdm2 to stabilize p53 protein and causes p53-mediated apoptosis. Importantly, we observe that wt-p53 is required for NCL translocation upon cellular DDR. In this study, we assess the role of NCL phosphorylation in the progression of the cellular DDR. Our central hypothesis is that in the presence of wt-p53, NCL triggers the downstream DNA damage pathway. We selected human cancer cells with differential genetic background for p53 (wt or mutant) to assess NCL-dependent cellular DDR. We assessed predominantly three pathways: ATM, ATR and p38 MAP kinase pathways with DNA damaging conditions that cause either double or single strand breaks (DSB or SSB). Both DSB and SSB lead to γH2AX phosphorylation, a common marker used as a measure of cellular DDR. ATM pathway activation (as a measure of DSB caused by doxorubicin) required the presence of wt-p53. Environmental stress responsive p38 kinase pathway activated with HSP27 phosphorylation uniquely with wt-p53 while phosphorylation of p38 kinase and SAPK/JNK were evident with mutant-p53. NCL-wt predominantly activated p38-kinase pathway as against NCL-mutant. Importantly, apoptosis biomarker cleaved caspase-3 expressed independent of p53-status upon DD. Together, these data suggest that cellular response to DDR via ATM pathway required wt-p53 while p38-kinase pathway activated independent of the p53-status where NCL-phosphorylation play a role. Differential DDRs ultimately implicate alteration in gene expression to modify cellular fate.

BIO – 12 METAGENOMIC ANALYSIS OF BACTERIAL COMMUNITIES IN RECIRCULATING AQUAPONIC SYSTEM

Demitri Lifgren (GRAD), **Jonathan Kim** (UN), Theodore Muth, Department of Biology, Brooklyn College, Brooklyn, NY and Robert Dickie, and Martin Schreibman, Aquatic Research and Environmental Assessment Center, Brooklyn College

Aquaponics is the integration of aquaculture and hydroponics. Using a recirculating system, aquaponics produces minimal waste and does not require pesticides, antibiotics, or fertilizer. These features make aquaponics uniquely suitable for implementation in an urban environment, and provide a much sought after alternative to traditional agricultural techniques. Bacteria are an integral part of a recirculating aquaponic system. Beneficial bacteria convert fish metabolic waste into plant food, while pathogenic bacteria can cause infections that lead to the death of fish and plants. Management of the bacterial community is key for maintaining a functioning system, however little is currently known about the overall bacterial community and how it's distributed in a system. In this study a metagenomic approach was used to assess the bacterial community in the Brooklyn College AREAC aquaponic system. The system consists of a fish tank, biofilter, sludge tank, hydroponic tank, and sump. Water and biofilm

samples along with water nutrient and quality measurements were taken at each tank. Samples sites were selected to represent the different microenvironments found in a system. DNA was extracted using MoBio PowerWater kit and Illumina Miseq sequencing of PCR-amplified V1-V3 16s rRNA gene fragments was carried out. Raw sequence reads will be processed using microbial analysis software QIIME and statistical analysis of OTUs with R package Phyloseq.

BIO – 13 CORRELATION OF NUCLEOLAR INDEX OF NUCLEOLIN AND CELLULAR DNA DAMAGE RESPONSE (DDR)

Danielle Gordon (UN),[1] Anna Kozlova,[1] Rumsha Javed,[2] Iqra Nadeem,[3] Anjana Saxena[4]
[1] Department of Biology, Brooklyn College, BA/MD Program, Brooklyn College, Macaulay Honors College
[2] Midwood High School, Brooklyn, NY
[3] Department of Biology, Brooklyn College, BA/MD Program, Brooklyn College
[4] Department of Biology, Brooklyn College

Nucleoli provide a survival advantage for various types of tumors e.g. prostrate neoplasia, leukemia, and lung and breast carcinoma. Nucleolar markers often correlate with cellular proliferative status and hence are useful as an index for diagnostic and prognostic purposes. In this study, we examine an abundant nucleolar stress factor, nucleolin (NCL) for its sub-nuclear localization under normal and upon DNA damage conditions. Further, we assess the requirement of the wt-p53 tumor suppressor protein for its response to cellular DNA damage. We take advantage of two human ductal breast epithelial tumor cell lines with different genetic backgrounds (wild type, wt-p53 and mutant, mut-p53) to assess NCL translocation upon DNA damage. We demonstrate that NCL is predominately nucleolar in unstressed conditions irrespective of p53 status. Upon genotoxic stress, however, wt-p53 is required for NCL to translocate from the nucleolar region to nucleoplasmic region. Interestingly, another nucleolar factor, nucleophosmin (NPM) remains unaltered upon stress conditions. This study corroborates not only the previous research that suggests NCL translocation is p53 dependent, but also provides new insights about mut-p53 playing a significant role in altering nucleolar response to stress. NCL shuttling from its normal nucleolar location to the nucleoplasm, centrosome, cytoplasm, or to the cell membrane directly implicates its multifunctional role/s in various cellular processes. Our study elucidates a novel approach of assessing NCL localization in nucleolar stress response.

BIO – 14 THE EFFECTS OF SETTLING RATE ON MULTICELLULARITY

Charlotte Williams (UN), **Brianne Philippe** (UN), Dalia Blackmon, Sierra Louis-Gene, Ezinne Nwankpa, Serena Rockingster, Cyrano Yee, Brooklyn College, Brooklyn, NY

According to researchers, the origin of multicellular life, one of the most important developments in Earth's history, could have occurred with surprising speed (Yong, E., 2012). Researcher William Ratcliff and colleagues conducted an experiment to observe if they could facilitate multicellular evolution in a single-celled organism (Yong, E., 2012). The current study sought to use Ratcliff's experiment as a template to determine how settling rate affects the number of snowflake yeast produced. A single colony of yeast was obtained from a culture and inoculated into a flask of YPD media. The flask was then placed in an incubator for seven days at 75RPM and 32degrees Celsius. Media was then centrifuged and inoculated into a flask with fresh YPD media. Process was repeated every 7 days for 63 days. Every 7 days, 5 microliters were extracted from flask that had been incubating and placed on slide for analysis. We found that there were a significant number of snowflake cells that grew from Day 1 to Day 63. It can be concluded that the longer the cells were settling in the flask the greater number of snowflake cells evolved. However there were certain days that the numbers fluctuated which may have

been due to experimental errors. For future experiments the different levels of complexity could be observed under different temperature and environmental conditions. Learning about multicellularity and its potential impact will enable researchers to further scientific innovations.

BIO – 15 THE EFFECT OF WAVELENGTH AND PHASE ON PHOTOTACTIC RESPONSE AND DIEL VERTICAL MIGRATION IN NAUTILUS POMPILIUS

Rebecca Cohen (UN),[1] Jennifer Basil,[1] Yasmely Luna,[2] Saumik Islam,[2] Becky Li,[2] Divya Roy,[2] Sana Parvaz[2]
[1] Laboratory of Invertebrate Behavior and Ecology, Biology Department, Brooklyn College
[2] Brooklyn College, Brooklyn, NY

The chambered nautilus (Nautilus pompilius) undergoes nocturnal diel vertical migration (DVM) which consists of an ascent in the water column to depths of 200 m or fewer around sunset and a descent to deeper waters around sunrise. Recent research has determined that light plays an essential role as a cue to entrain the endogenous biological rhythms of nautilus, including their DVM, but the mechanism by which it acts is not understood (Lewandowski et al., in preparation). It is well known that nautilus demonstrate positive phototaxis (Ward et al 2011; Barord et al. 2015; Muntz 1987). Thanks to their physiological adaptations for highly efficient photon capture and their peak spectral sensitivity in the blue range (467 nm) the blue-shifted light available to nautilus when they awake around sunset may serve as a potent cue driving their vertical migration (Muntz 1987; Cohen 2002). The aim of this study is to determine if different wavelengths of light induce different phototactic responses in nautilus; we also consider whether nautilus' phototactic response varies in different phases of their biological rhythm. Distance traveled towards and away from two experimental light sources of differing spectral emissions was used as a measure of the strength of phototactic response. Trials were administered both during the daytime hours of nautilus' inactive phase, and during the nighttime hours of their peak activity. Insights revealed by this study will contribute to our understanding of the proximate cues maintaining biological rhythms, and conservation of these elusive creatures.

BIO – 16 BIOINFORMATIC STUDY OF WASP VENOM METALLOENDOPEPTIDASES INVOLVED IN IMMUNOSUPPRESSANT PARASITISM

Carlos Barreto (UN) and **Giancarlo Francisco** (UN), Brooklyn College, Brooklyn, NY

For a parasitoid species to propagate itself, it must somehow overcome the defenses of not merely an individual host but the set of defenses found within the allelic variation of the species. In order to avoid the immunological defenses mounted by the host, the parasite must adapt itself to the idiosyncrasies of the host species so that it may hijack, forestall, or otherwise interfere with the mechanisms that would mount a defense against it. Subsequently, the survival of these parasitic species is contingent upon a close association with its host that allows for a specificity of response that tightly binds their evolutionary fates. Drosophila melanogaster and Leptopilina heterotoma are one such parasitoid pair. The wasp parasitoid has evolved a complex venom that manages to manipulate the host immune system to preclude the activation of host defenses, giving the wasp's progeny sufficient time to develop and parasitize Drosophila larvae. This fascinating interaction is mediated by the wasp venom and analysis of the venom has found that it is comprised of a large number of proteins and virus-like particles that are currently being identified and characterized. This study focuses on a group 15 metalloendopeptidase proteins that have been isolated from the venom. Utilizing an integrated methodology of sequence and structural bioinformatics, including modeling and analyzing the three-

dimensional structures, we extend our current knowledge of metalloendopeptidase families to these novel proteins. The results from our study provides a framework from which we may derive likely function and generate testable hypotheses for experimental manipulation to elucidate their role in externally modulating and ultimately superseding host immunological regulation.

BIO – 17 BAR DOMAINS IN ARABIDOPSIS THALIANA

Rahimah Ahmad (UN), Jessica James, Zaina Naeem, Dameeka Lambert, Andrew Botrous, Jessen Thomas, Department of Biology, Brooklyn College, Brooklyn, NY

The aim of this study is to identify and model all BAR (Bin/Amphiphysin/Rvs) domains in the Arabidopsis thaliana genome. Arabidopsis is a well-studied model organism for dicot plants. Of all plants, it has the most extensive sequence information available in online databases. The BAR domain superfamily is a specialized protein domain family with a structural fold that is involved in selectively binding to and curving the plasma membrane within a cell. BAR containing proteins are known to be important in cell signaling, fission, nutrients uptake as well as metastasis and immune function in higher organisms. The functional unit is a crescent shaped dimer that is composed of two identical monomers, each of which takes on a tri-helical structure. The dimers have positive residues on their surface that allow for interaction with the negatively charged lipid headgroups of the plasma membrane. We have located 18 protein sequences in the online databases that fit the BAR domain motif. We first modeled each of the probable BAR sequences into their monomeric form. After evaluating the models, we used both automatic and manual methods to dimerize these subunits. Then we visualized the electrostatic profiles of these dimers. Our results summarize the predicted membrane-binding properties of the BAR domains of Arabidopsis thaliana proteins, suggesting putative functions, and compare them to known BAR domains found in other organisms.

BIO – 18 STRUCTURAL-FUNCTION ANALYSIS OF METHIONINE ADENOSYLTRANSFERASE IN LIVING FOSSILES CHAMBERED NAUTILUS: IS THIS PROTEIN CONTROLLING THEIR BIOLOGICAL CLOCK?

Mahwish Ashfaq (GRAD), Marwah Talbeh, Shaneen Singh, Brooklyn College and Jennifer Basil, LIBE Lab, Brooklyn College

The Chambered Nautilus is considered today as the oldest living fossil. Although Cehphalopod mollusks are well known for their vertebrate like intelligence and unique behavioral repertoires, little is known about the brain and physiology of the chambered Nautilus. Even less is known about the genomic makeup of these species. We are interested in analyzing the available sequence data for the chambered Nautilus and use computational tools to start delineating structure-function relationships for some of these proteins, with an emphasis on those involved in regulation of behavior. This study is focused on the computational analysis of an enzyme present in the chambered Nautilus known as the Methionine Adenosyltransferase (MAT). MAT is an enzyme involved in the synthesis of S-adenosylmethionine (SAM), which is a major intracellular methyl donor in all-living organisms. MAT catalyzes SAM biosynthetic reaction from methionine and ATP. Previous studies have demonstrated that MAT activity regulates daily rhythms in humans and we want to investigate whether MAT also plays a role in regulating the endogenous circadian/ biological clock of Nautilus as well. Our analyses show that the MAT sequence is highly conserved in various organisms suggesting similar functionality. Here we present the detailed sequence and structure based analyses of the modeled Nautilus MAT protein.

BIO – 19 STRUCTURE AND FUNCTION ANALYSIS OF DUNC-115 USING CRISPR-CAS9

Rabina Lakha (GRAD),[1] Nonso Nwasike,[1] Saad Alghamdi,[1] Christopher Roblodowski,[2] Robert Gomez,[1] Sebastian Giordano,[1] Qi He[1]
[1] Department of Biology, Brooklyn College, Brooklyn, NY
[2] Queensborough Community College, Queens, NY

Significant progress has been made toward a better understanding of the axon guidance mechanisms during animal development. Several guidance pathways have been revealed where signaling initiated at the surface receptor levels is relayed to the interior of neurons through numerous adapter proteins leading to cytoskeleton reorganization and other responses. We previously showed that the Drosophila protein Dunc-115, a homolog of the Unc-115 from the C. elegance, is involved in the axon projection in the CNS and the visual system. Furthermore, our data also demonstrated that Dunc-115 binds to actin filaments, implying a possible mechanism for actin reorganization via Dunc-115. Dunc-115 is alternatively spliced resulting in the formation of three isoforms, and it has been not possible to dissect the functions of individual isoforms. Here, we report that by using the recently available CRISPR, we have generated mutant animals where the actin binding domain (VHD) of the longest isoform is deleted. The deletion of the VHD domain has severe phenotypic defects. The results suggest that the actin binding domain is essential and that different isoforms function differently. The outcome of the structure and function analysis will be discussed.

BIO – 20 CIRCADIAN CHANGES IN BEHAVIOR IN THE CHAMBERED NAUTILUS

Naomi Lewandowski (GRAD),[1] Mahwish Ashfaq,[2] Rebecca Cohen,[2] Ned Ellis,[3] Jaylene Salas,[4] Yasmely Luna,[2] Jennifer Basil[2]
[1] Biology Department, Brooklyn College and CUNY Graduate Center
[2] Biology Department, Brooklyn College
[3] Packer Collegiate Institute
[4] East Brooklyn Churches Bushwick High School

Chambered Nautilus makes repeated daily migrations from deep to shallower waters, foraging along coral reefs. It is unknown what modulates these daily rhythms; perhaps the detection of light drives the dives to deeper depths, or these daily rhythms could be an expression of an endogenous circadian clock. We continuously videotaped a captive group of nautiluses (N=5) under three L:D (Light:Dark) conditions, of 4 days each. We measured their activity levels, movement patterns, and inter-animal associations for one minute every 10 minutes. First animals were exposed to 12:12 L:D for 4 days to determine if they would entrain to a set light cycle. We then released them into constant darkness (D:D) for 4 days to determine if they expressed an endogenous free-running rhythm with a set period in the absence of external cues. Finally, we re-exposed the nautiluses to the 12:12 light cycle to determine their re-entrainment patterns after free-running in darkness. Nautiluses show clear entrainment to 12:12 Light: Dark, with peak activity in darkness, beginning around subjective dusk. In D;D, subjective dusk/night activity rhythms persisted, although the free-running period was less than 23h. This is the first demonstration of endogenous biological rhythms in Chambered Nautilus.

BIO – 21 BURROWING BEHAVIOR OF FIDDLER CRABS (UCA PUGALATOR) IN JAMAICA BAY

Ran Fontenelle (UN), **Alen Douda** (UN) and Frank W. Grasso, BCR Lab, Department of Psychology, Brooklyn College, The Graduate Center at CUNY

Fiddler crabs are small crustaceans in which the males possess asymmetrically sized dactyls (claws): a large, brightly-colored dominant claw and a smaller plain dactyl. The large claws are used to signal

potential mates and in dominance contests between males. It is surprising given the energy these males expend in rivalrayl for control of burrows that the animals appear to live in close social units with numerous burrows in close proximity. In Jamaica Bay, Brooklyn, we have identified two fiddler crab colonies in the upper parts of the shores in sandy and muddy sediments. We have begun longitudinal field observations of these colonies. As part of this effort we have made quantitative surveys of these two colonies (Site 1 and Site 2). Using a systematic quadrat protocol we mapped the locations of all the burrows at both sites. We found burrow densities of 6.99 burrows per square meter. And an average nearest neighbor inter-burrow distances of 11.32 +/- 8.82 cm. These values suggest greater heterogeneity of burrow spacing that is seen elsewhere. In this ongoing research we will track these densities over time. We can see how the average density and inter-burrow distance changes over time to study for seasonal variation in social behavior of these animals.

BIO – 22 THE ROLE OF MUTATIONS OF GENES INVOLVED IN TYPE IV PILI BIOGENESIS ON THE SURVIVAL OF NEISSEIRA ELONGATA

Kaleish J. Ambris (UN), Nicolas Biais, Theresa Tawadros, Department of Biology, Brooklyn College

We study the model system of Neisseria gonorrhoeae and its cousin Neisseria elongata which have to produce a physical force in order for them to survive well. This physical force is caused by the Type IV pili which allows for the bacteria to attach to surfaces and other bacteria cells resulting in retraction and an exertion of force on their surroundings. The retraction of Type IV pili is controlled by a molecular motor, an ATPase called pilT. ΔpilT in Neisseria gonorrhoeae strains have poor survival in a static biofilm assay. In Neisseria elongata, wild type elongata strain has a poor survival in similar conditions. We examined the mutants of genes involved in Type IV pili biogenesis in Neisseria elongata to see if they had a specific response to 24 and 48 hours survival assay. DNA was extracted from three Neisseria elongata strains: ΔpilC, ΔpilTβ and ΔpilTη, amplified using PCR, purified to remove PCR impurities and then Spot transformations were performed on the samples to select for the mutants. These mutants were streaked, lawned and added to 6 well plates containing liquid culture medium for two different incubation times: 24 hours and 48 hours. The 6 well plates for both incubation times were placed into an incubator at 37°C. After each incubation period was done, serial dilutions were performed on the bacteria which were then plated onto agar plates, placed into the incubator for an additional 24 hours and counted for the colonies formed. From the results collected, we have found that wild type elongata survived less in both the 24 and 48 hours survival assay while the new double mutants survived longer and there was variability in the response of the different single ΔpilT mutants which was tracked down to genetic differences in the clones.

BIO – 23 GENERATION OF A MUTANT LIBRARY IN NON-TUBERCULOUS MYCOBACTERIUM, M. KANSASII, USING A PHAGE TRANSPOSON MUTAGENESIS SYSTEM

William C. Budell,[1] **Sherry Oommen** (UN),[2] Claudia Zmijewski,[2] Luis E. N. Quadri[3]
[1] Ph.D. Program in Biology, CUNY-Graduate Center
[2] Macaulay Honors College at Brooklyn College
[3] Department of Biology, Brooklyn College

Among the hundreds of identified nontuberculous mycobacteria (NTM), Mycobacterium kansasii is the closest genetic relative of Mycobacterium tuberculosis, a species that kills millions of individuals across the globe every year. M. kansasii, though significantly less pathogenic and widespread than M. tuberculosis, is an environmental bacterium that can cause pulmonary and extra-pulmonary infections and is the second most prevalent cause of NTM disease in patients with AIDS. However, research into

the biology of this opportunistic pathogen is lacking. To expand our knowledge of M. kansasii, we generated a transposon mutant library and screened 768 mutants on various solid media. The media types selected have previously been used to demonstrate unique phenotypes resulting from cell wall alterations that have been correlated with mycobacterial virulence. Among the mutants so far identified in the screen are 30-40 that display unique colony phenotypes suggesting disruption to genes involved in the biosynthesis and maintenance of the cell wall. Combining an analysis of the genetic elements at and surrounding the site of transposon insertion with the characterization of selected mutants using specific assays will further our understanding of both the cell-wall biology and virulence of M. kansasii, and by extension M. tuberculosis.
Supported by NIH

BIO – 24 EXPRESSION OF NLP-29 IN C. ELEGANS FOLLOWING FUNGAL COLONIZATION
Brett Hoppe (GRAD), Brooklyn College and Melissa Garcia, and Peter Lipke, Department of Biology, Brooklyn College

Candida albicans is an opportunistic fungal pathogen which utilizes adhesion proteins of the ALS family to colonize its host. C. elegans, a transparent and well characterized nematode, provides a convenient host model for infection. C. elegans produces antimicrobial peptides such as the neuropeptide-like proteins of the NLP family in response to infection by fungal pathogens. Thus, the nlp-29 gene serves here as a marker for immune response in C. elegans to fungal pathogens. It has been shown previously that worms fed S. cerevisiae expressing Als5p form a commensal-like state with the yeast. The goal of this project is to determine nlp-29 expression in individual worms within populations fed on S. cerevisiae expressing either Als5p or harboring an empty vector. We hypothesize that nlp-29 is up-regulated in response to empty vector yeast versus yeast expressing Als5p. To test this we utilized single worm qPCR to compare the relative expression levels of nlp-29 under the aforementioned conditions. We found nlp-29 was significantly down-regulated in C. elegans fed on yeast expressing only empty vector versus yeast expressing Als5p. We plan to validate this molecular data with microscopy using an nlp-29 reporter strain which has GFP fused the nlp-29 promoter.

BIO – 25 DISSECTING THE ROLE OF SHUGOSHIN AND SEPARASE PROTEINS IN CHROMOSOME AND CENTROSOME INHERITANCE IN MEIOSIS
Saul M. Betesh (UN), **Aj James** (UN), Mara Schvarzstein, Department of Biology, Brooklyn College

Correct regulation of sister chromatids and centrioles separation during meiosis is essential for the proper genetic inheritance in gametes. This is vital for survival of the organism post-fertilization. We use the C. elegans nematode to study the highly conserved regulation of chromosome and centrosome inheritance during meiosis. Shugoshin and Separase proteins have been identified as having critical roles in regulating sister chromatid separation. These proteins also have been shown to function in centriole separation in vitro. C. elegans spermatocyte meiosis is the first system that allows the study of these proteins in vivo. Shugoshin protects the cohesin protein that keeps sister chromatids together until the right meiotic stage. Our prior work showed that Shugoshin keeps centrioles together during the second meiotic division of spermatocytes. Separase is responsible for removing cohesin at the onset of sister chromatid separation and if unregulated it can cause the abnormal separation of centrioles. The interaction of Shugoshin and Separase in carrying out their respective roles in chromatid and centriole separation is still unknown. To further our understanding of the roles of both proteins we are using molecular genetic and cell biological approaches. Since Shugoshin mutants on their own have no obvious phenotype, a genotyping assay for this strain was developed to follow the mutation during

crosses. Using Immunofluorescence staining and high-resolution imaging the effects of the combined mutations on the chromosomes and centrioles will be assessed. It is hypothesized that shugoshin interacts with Separase in regulating sister chromatid separation and that both proteins are involved in regulating centriole disengagement.

BIO – 26 THE IMPACT ON MASS HUMAN TRAFFIC ON URBAN MICROBIAL COMMUNITIES
Florence Haut (UN) and Afra Abid, Department of Biology, Brooklyn College

Studies have found that interactions between humans and their environment can affect the size and diversity of local microbiome communities. Most research has focused on indoor microbiomes. Few studies have looked at the effect of human activities on exterior communities, and none have focused specifically on the effect of mass human traffic on urban microbial communities. The purpose of this study is to determine if one type of heavy traffic, a foot race, causes a change in microbial communities. Does contact with humans outdoors change the abundance and diversity of microbiome communities? Bacterial samples will be collected from roadways at the 1st, 6th, and 13th mile of the Brooklyn Half Marathon using sterile cellulose sponges. DNA will be extracted using the MoBio (Carlsbad, CA) PowerSoil kit for the hard surfaces or soil samples. If samples require concentration or purification, an ethanol precipitation will be completed. DNA samples will be submitted for Illumina MiSeq (PE250) sequencing of the V1-V3 region of the 16S rRNA gene. Sequencing will be completed by the MrDNA Molecular Research Laboratory (Shallowater, TX). Quality control filtering processing and data analysis will be completed using the QIIME pipeline software.

BIO – 27 CHARACTERIZATION OF PUTATIVE DIEDEL PROTEIN IN LEPTOPILINA HETEROTOMA
Aulon Jerliu (UN), Brooklyn College

The wasp Leptopilina heterotoma, is a species that cannot complete its life cycle without exploiting a suitable host. For this reason, when the wasp deposits its eggs, it deposits them into the larvae of the fly, Drosophila melanogaster. In doing so, it coats its eggs in immune silencing particles. These particles have been called viral-like particles (VLPs) due to their morphology, but are not able to replicate on their own and cannot initiate lytic or lysogenic cycles like traditional viruses. One of the proteins that makes up a VLP is speculated to be a homolog of the fly Diedel protein. Diedel plays a role in immediate septic immune responses in Drosophila. Since this protein is believed to only exist in Drosophilids, its occurrence in the wasp may have important implications in its virulence mechanism. To conclusively ascertain that this putative Diedel protein behaves like the fly Diedel with respect to structure and function, we have carried out a computational analysis of its sequence and modeled structure. Our results confirm that this VLP protein adopts the structural fold of Diedel and we present a comparative analysis of it with the fly Diedel.

BIO – 28 CHARACTERIZATION OF AMYLOID FORMING REGIONS WITHIN THE FLOCCULATION PROTEIN FLO1P
Dilek S. Sen (UN), Department of Biology, Brooklyn College

Flocculation is the process by which thousands of cells adhere to each other, separate from the bulk medium, and rise to the surface (Wang 2008). The FLO1P gene, located on chromosome 1 of Saccharomyces cerevisiae, is a dominant flocculation gene that codes for a phenotype sensitive to mannose. FLO1P contains three domains: an amino-terminal lectin domain protruding from the cell surface and responsible for binding to carbohydrate; a central domain rich in serine and threonine residues; and a carboxy-terminal which contains a glycosyl phosphatidylinositol (GPI) anchoring

sequence. This paper focuses on the repeats in the open reading frame (ORF) of the central domain that mediates flocculation (Li et al. 2013). The open reading frame is 4614 bp long with 1537 amino acids, in which 18 tandem repeats (TR) were identified. Most of the TR, with the exception of the last are organized as follows: five amino acids, TVIVI, precede two amino acids, PW, by 14 residues. The structure and function of the TR was elucidated using secondary structure analysis (PSIPRED, YASPIN, JPRED, SABLE, and SOPMA) and ab initio protein modeling (Robetta, Quark, and i-Tasser). Based on our analyses, we propose that the repeats comprise of 3 beta sheets. This study lays the foundation of understanding the mechanism of aggregation by investigating the structural nature of the repeats and the interaction of the repeats with each other and is an important step towards discovering how amyloids can be used in anti-biofilm formation treatments (Chan 2014).

BIO – 29 TESTING SALT-WATER FROM SHEEPSHEAD BAY FOR BACTERIAL CONTAMINATION

Maftuna Kurbonnazarova (UN), Department of Science, Borough of Manhattan Community College

Bacteria are among the earliest forms of life that appeared on Earth billions of years ago. The U.S Environmental Protection Agency (EPA) is typically involved in testing recreational water for pathogens, mostly for Escherichia coli. E. coli are found in the environment, in foods, and beneficially in the intestines of humans and other animals. The presence of E. coli in water samples can indicate fecal contamination. For this project, water was sampled from the Sheepshead Bay "Ocean Avenue Footbridge" in Brooklyn and tested for bacterial contamination using a modification of the EPA protocol. Two water samples, which were from a saltwater source, were streaked on marine agar plates and on nutrient agar (non-marine) plates. For each set of clones, single colonies were selected and grown on either marine agar or nutrient agar. Individual clones from one water sample were examined by staining with Gram stain, negative stain, and acid-fast stain. Several clones were identified by microscopy as possible E. coli. Biochemical tests performed on bacterial clones obtained from the second water sample also indicated possible E. coli. Growth experiments indicated that all bacteria isolated from marine water grew at similar rates both in marine media and in non-marine media (LB broth). These experiments will be repeated to more accurately measure exponential and linear growth rates of these bacteria in various saline conditions. Additional experiments will also be done to identify these bacteria conclusively by DNA analysis and to measure the concentration of these bacteria from this Sheepshead Bay location.
Supported by CSTEP

HNS – 1 THE EFFECT OF BLINKING EXERCISES ON SYMPTOMS ASSOCIATED WITH COMPUTER VISION SYNDROME

Roshan Chudhry (HS),[1] Mark Rosenfield,[2] Glenn Elert[1]
[1] Midwood High School, Brooklyn, NY
[2] Department of Vision Sciences, SUNY Optometry

Many people suffer from a condition known as Computer Vision Syndrome (CVS) which is caused by viewing an electronic device for long periods of time. Red eyes, photophobia, and dry eyes can develop from CVS. Since device use is increasing, these symptoms are beginning to become more common in the general population. CVS is thought to be caused by dry eyes which is a result of a decreased rate of blinking. When viewing an electronic device, blink rate decreases and people do not blink completely. This is harmful as blinking is a necessary function which helps to rewet the eye. This study aimed to improve CVS symptoms through the use of blinking exercises which are thought to increase blinking rate

and decrease incomplete blink rate. In this study, participants went through three trials in which they would read off a tablet for ten minutes with a survey to answer about dry-eye symptoms. For two trials they would complete either a control or experimental blinking exercise before the task. The means, standard deviations, and t-tests of the participants' changes in symptom score, blink rate, and incomplete blink rate from the first to the second/third trial were calculated. The results showed that symptom scores and blinking rate increased while incomplete blinking rate decreased for both the exercise and the control. There was no significant difference between the exercise and control therefore the results may have occurred due to chance. However, there are improvements that could be made to this study. Many students were tired after a long day which could have added to their symptoms and also they were only given one-minute breaks. Participants could be tested on three separate days to ensure that they would not be affected by the previous trials.

HNS – 2 VIDEO GAMES: THE BENEFITS FOR DIFFERENT AGE GROUPS

__Ricky Y. Lovell__ (HS), Midwood High School at Brooklyn College, Brooklyn, NY

Why do kids, teens and adults love gaming so much? A question many parents might ask. Teen and adult gaming play a major role in the entertainment business. The purpose of this research is to determine what this major role is. Our objective is to find out what makes these games so entertaining. Many gamers and non-gamers were surveyed with a unique set of questions that would help answer the question, "why do kids, teens and adults love gaming?". I used social media to distribute my survey. Participant's answers were recorded anonymously on Google forms and analyzed after a week. The data showed that much of a player's love of the game had to do with the player's motivation. In summation, the majority of people play for entertainment and stress relieving purposes.

HNS – 3 EFFECT OF HYDRATION ON FOOD INTAKE IN ADULTS

__Rashaun Williams__ (UN),[1] Naomi Mckay,[2] Jennifer Temple[2]
[1] Brooklyn College, Brooklyn, NY
[2] School of Public Health and Health Professions, University at Buffalo

Obesity and excess weight are major issues not only in America, but all over the world. Many people seek out diets to lose weight. Currently, drinking water before a meal is a well-known and accepted way to lose weight. There are, however, only limited scientific studies on this and they have variable results with only some studies finding that water before a meal decreases food intake. We hypothesize that participants in the hydrated condition will have less energy intake during the lunch buffet provided to them. Participants were both male (n=21) and female (n=24) age 18-50. Each participant goes through each of the three conditions: control, acute and hydrated on three different days. While in control condition participant drank one bottle of water, acute drank two, and hydrated drank three. The size of every bottle was 500mL. The weight for each food item was measured and kept constant. After the participants were finished we measured the difference from the original to find how many grams they consumed from each food item. A random measures ANOVA was done to analyze the data obtained. We found that normal weight participants in the hydrated condition had a lower energy intake than their other two conditions, control and acute. In regards to macronutrient intake, normal weight male participants in the hydrated condition consumed less protein and carbohydrates than their other two states of hydration. There were no changes found in sodium or fat within any of the participants. Our data shows that being in a hydrated condition, drinking three bottles of water, leads to a decrease in energy intake in normal weight participants. This proves that drinking water prior to a meal and staying well hydrated can lead to less energy intake which can cause weight loss.

HNS – 4 EFFECTS OF HIGH FAT MENHADEN OIL AND SAFFLOWER OIL VS LOW FAT DIETS ON INSULIN RESISTANCE

Keerteshwrya Mishra,[1] **Julia Buczynski-Kos** (UN),[1] **Tashanne Distin** (UN),[1] Kanwal Khan,[1] Kathleen V. Axen, Ph.D.[2]
[1] Brooklyn College, Brooklyn, NY
[2] Department of Health and Nutrition, Brooklyn College, Brooklyn, NY

Fish oil has been shown to reduce the incidence of cardiovascular diseases in certain populations. However, the effect of fish oil on insulin resistance, a major part of diabetes mellitus, remains unclear. We addressed this question by comparing the effects of high intakes of Menhaden Oil (MF) vs. Safflower Oil (SWF) in rats, using a Low Fat (LF) diet as a control. Thirty male Sprague-Dawley rats were divided into 3 groups: LF, MF, and SWF. After a one-week feeding, rats were fasted for 24 h and then refed for 16 h. Blood samples were collected from each time, from half the rats. Fat pads were dissected and blood and liver samples were collected to measure triglyceride (TAG) and glucose levels. Liver samples were analyzed with pcr using Taqman assays to determine gene expression of: GPAM (Glycerol-3-Phosphate Acyltransferase, Mitochondrial; involved in TAG synthesis), FAS (Fatty Acid Synthase; vital for fatty acid metabolism), SCD1 (Stearoyl-CoA Desaturase; vital for fatty acid metabolism), and SREBP1C (sterol regulatory element binding transcription factor 1; master switch of these genes). MF had the lowest average percent body fat ($p < 0.05$). Liver lipid concentrations were highest for the SWF ($p < 0.01$). There was no significant difference in plasma glucose levels between the groups, but insulin values were lowest in MF, in both states. MF also had the highest average fasted plasma TAG level and lowest average refed TAG levels. GPAM, SCD1, and SREBP1 had the lowest expression in the MF. The ability of lower insulin levels to maintain normal blood glucose levels indicates greater insulin sensitivity in the MF group. This may be related to lower body fat, liver lipid concentration, and expression of genes involved in fat synthesis in the MF but not the SWF diet group.
Supported by NIH

HNS – 5 THE EFFECT OF MATERNAL CHOLINE SUPPLEMENTATION ON DOCOSAHEXAENOIC ACID METABOLIZING GENE EXPRESSION IN THE FETAL MOUSE BRAIN

Yaelle Joselit (GRAD), Brooklyn College and Dr. Xinyin Jiang, Department of Health and Nutrition Sciences, Brooklyn College

Gestational diabetes mellitus (GDM) is a condition characterized by maternal glucose intolerance during pregnancy. GDM-affected neonates have lower cord blood concentrations of docosahexaenoic acid (DHA), a polyunsaturated fatty acid that is imperative to normal brain development. Phosphatidylcholine (PC), a derivative of the essential nutrient choline, incorporates DHA in its side chains. Increasing choline intake leads to higher erythrocyte PC-DHA. This study aimed to assess the influence of choline on fetal DHA metabolism in a mouse model of GDM. High-fat feeding six weeks before and during pregnancy was used to induce GDM-like symptoms in C57BL/6J mice. The animals received 25 mM choline chloride, 1% betaine (an oxidative product of choline), or control drinking water until embryonic day (E)17.5. Fetal brain samples were collected for gene expression analysis. Results indicate that the mRNA expression of phospholipase A2 (Pla2g6) which cleaves DHA from its esterified form was upregulated in high-fat fed animals and was further elevated in the choline supplemented dams. Betaine supplementation in high-fat fed animals increased their expression of fatty acid binding protein 5 (Fabp5) which transports saturated fatty acids. Fabp7 which transports DHA and Fabp3 which transports omega 6 polyunsaturated fatty acids were not altered by high-fat or choline supplement. These results suggest that choline supplementation may aid in DHA uptake in the brain of GDM fetuses

due to an active phospholipase A2 that releases free DHA. Further studies will examine the differences in brain DHA concentrations and functional alterations among the groups.

HNS – 6 EFFECTS OF MATERNAL CHOLINE INTAKE ON GROWTH OUTCOMES OF GDM MICE

Keshia S. Okorie (UN) and Dr. Xinyin Jiang, Brooklyn College, Brooklyn, NY

This study aims to investigate the differential growth outcomes in male and female offspring of maternal mice with or without choline supplementation, in the mouse model of high fat diet induced gestational diabetes mellitus (GDM). C57BL/6J mice were fed either a high fat diet or a low fat diet over the course of 6 weeks before gestation to induce GDM-like symptoms during gestation. They received either 25 mM choline or control drinking water. We studied the effects of choline on placental weight as well as fetal weight and length on embryonic day (E) 12.5 and E17.5. Although prior evidence suggests that males and females would respond differently to maternal choline intake, other than higher placental weights in male offspring, our evidence shows no significant difference between male and female embryos in response to maternal diets. Choline supplementation appears to normalize placental and fetal growth in early (E12.5), but not late gestation (E17.5). Choline supplementation appears to be similarly beneficial to both male and female offspring at early gestation in the mouse model of GDM.

HNS – 7 THE TIMECOURSE EFFECT OF HIGH FAT DIETS ON PLASMA CONCENTRATION AND HEPATIC EXPRESSION OF RETINOL-BINDING PROTEIN 4 IN RATS

Jo Ann Brown (GRAD), Kate Russell, Kadeem Thomas, Kenneth Axen, Ph.D., Kathleen Axen, Ph.D., Department of Health and Nutrition Sciences, Brooklyn College

Retinol-binding protein 4 (RBP4) has been associated with insulin resistance and hepatic steatosis. The ability of high-fat diets to produce hepatic insulin resistance is dependent on their fatty acid composition. The time-course effect of three high-fat diets was compared to a low-fat diet on plasma concentration and hepatic expression of RBP4 in rats. Weight-matched groups (N=10/group) of male Sprague-Dawley rats received one of four diets for eight weeks: low-fat (15% kcal fat), or a high-fat (55% of kcal) polyunsaturated, a cis-monounsaturated or a trans-monounsaturated fat diet. Blood samples were collected at weeks 3, 6 and 9 from rats that had been food deprived for 24 hours. Liver samples were collected at week 9. Plasma RBP4 concentrations were measured by ELISA. Hepatic expression of RBP4 was measured by real-time pcr amplification. Hepatic lipid concentration was measured using chloroform:methanol extraction. Body weights did not differ among groups at any time-point. Plasma RBP4 was higher in high-fat groups when compared to low-fat group at week 3. This effect diminished during subsequent weeks. An inverse relationship between hepatic expression of RBP4 and plasma RBP4 levels trended at week 9. Our results indicate that long-term intake of high-fat diets produces a short-term effect on plasma RBP4, with variations between high-fat groups. Plasma concentrations were positively correlated with liver lipid ($p<0.031$) suggesting a relationship between plasma RBP4 and fatty liver. RBP4 expression may be acutely influenced by high-fat feeding and was negatively correlated with plasma insulin ($p<0.022$) suggesting hepatic RBP4 expression as an index of insulin sensitivity.

HNS – 8 EFFECT OF TRANS VERSUS CIS-MONOUNSATURATED HIGH FAT DIETS ON INSULIN RESISTANCE AND METABOLIC ABNORMALITIES

Kate Russell (GRAD), Jo Ann Brown, Kadeem Thomas, Kenneth Axen, Kathleen Axen, Department of Health and Nutrition Sciences, Brooklyn College

Insulin resistance (IR) is associated with metabolic abnormalities, including obesity, fatty liver, and inflammation. Trans fat has recently been implicated in the incidence of obesity and type 2 diabetes.

Dietary trans fat is comprised primarily of monounsaturated fatty acids (MUFA). The effect of a trans-MUFA diet (vegetable shortening) was compared to that of a cis-MUFA diet (olive oil) and a low fat diet on IR and metabolic parameters in rats. Thirty male Sprague-Dawley rats were divided into 3 diet groups: high fat (HF) trans-MUFA, HF cis-MUFA (both 55% of kcal fat), or low fat (LF; 15% kcal fat) for 8 weeks. At week 7 of feeding, an insulin tolerance test was performed. After 8 weeks of feeding, body composition (body weight, % body fat) was the same between the two HF groups, but was higher than the LF group (p=0.035, 0.001). Liver lipid and fasting plasma insulin were higher in the cis-MUFA group compared to the LF group (p=0.026, 0.014). HOMA-IR was higher in the cis-MUFA group compared to the LF and trans-MUFA groups (p=0.002, 0.007). All three groups had a similar rate of decrease in plasma glucose in response to insulin injection, but the cis-MUFA group had higher plasma glucose concentrations than the LF group. Hepatic lipogenic gene expression (FAS, SCD1) in response to carbohydrate refeeding was higher in the HF groups versus the LF group. There was a trend toward higher hepatic IL-1β expression in the cis-MUFA group versus the LF group, but the difference was not significant (p=0.054). Contrary to expectations, the cis-MUFA diet had the greater effect on producing IR in rodents. Our findings suggest that intake of HF trans-MUFA or HF cis-MUFA diets result in increased body weight and body fat %, fatty liver, and an impaired response to insulin.

ENV – 1 THE EFFECT OF PH ON THE GROWTH OF MYCELIUM IN LIQUID CULTURE

Diana Polonska (HS), Midwood High School, Brooklyn, NY

The research goal of this project is to find an effective pH level for liquid cultivation of oyster mushroom. The Pleurotus ostreatus proved to be a strong contender for liquid cultivation after the tissue culturing experiment. The Pleurotus ostreatus had grown at a very fast rate under appropriate conditions in the liquid culture jars. It completely filled up the top portion of the jar and after each week, the layers of mycelium grew thicker after the initial stages of growth being the mycelium only covering the surface of the actual liquid culture broth. Since the spores of the mycelium have generated into a network, the colonization time of the mycelium was faster and was able to avoid possible contamination with the speed. This way of cultivating the mushroom is also economical because one syringe of the mycelium can make many gallons of liquid culture. With liquid culture being a very efficient way of growing mycelium, finding a pH level in which it produces the most successful growth of mycelium at a speedy pace, would be beneficial for the cultivation of mycelium that can be used for decontamination of soils.

ENV – 2 THE PH AND SALT CONCENTRATION OF ARTIFACTS IN URBAN SOIL

Nadia Brijmohan (HS),[1] Hermine Huot,[2] Dr. Zhongqi (Joshua) Cheng [3]
[1] Midwood High School, Brooklyn, NY. [2] Brooklyn College, Brooklyn, NY.
[3] Department of Earth and Environmental Science, Brooklyn College, Brooklyn, NY

Anthropogenic, or human introduced environmental pollutant is often the cause for dramatic alteration in urban soils (El Khalil, 2008). Urban areas are exposed to human generated air and water pollution as well as traffic, which likely introduce contaminants into urban soil (Morel, 2005). Urban soils also can contain large amounts of course fragments, including artifacts, which are remnants of man-made objects. Coarse fragments in urban soils can change the properties of the soil. Slag and coal are two of the main types of artifacts found in urban soil (Shaw, 2010). In this study artifacts found in various urban soil samples were sorted and characterized into different groups, and their pH level and salt concentration were compared to the pH level and salt concentration of a controlled sample of fine fraction soil. Testing for pH and salts measures the acidity or the alkalinity in the soil. In order to test the presence of contaminants in urban soil, pH tests were conducted. The artifacts are ground into a fine powder and tested for pH and salts concentration. To add on, the high contents of salts in the soil could be harmful for the plants and the other organisms in the soil. The influence on the amount of availability in the soil is influenced by the pH test. When there is a low pH range, four to six, the artifacts present in the soil are acidic. The data from this study showed that the artifacts in the urban soil in New York City are acidic.

ENV – 3 HOW DOES THE PRESENCE OF STROPHARIA RUGOSO-ANNULATA IN DIFFERENT TYPES OF SOIL AFFECT THE GROWTH OF RYEGRASS?

Colleen O. Simon (HS), Midwood High School, Brooklyn, NY

The purpose of this experiment was to determine whether the presence of the Stropharia Rugoso-annulata (garden giant) mycelium would support ryegrass growth. Based on the nature of their methods to degrade polycyclic aromatic hydrocarbons (PAHs) in the soil, it was hypothesized that a symbiotic relationship would form and the growth of the ryegrass would be supported and enhanced. The results show that the presence of the garden giant mycelium in fact had a negative impact on ryegrass growth. In terms of height, comparing the controls to the samples inoculated with garden giant showed no patterns to indicate that there was a positive or negative impact on ryegrass growth. However, in terms of ryegrass biomass yield, there was a slight association between introduction time of the mycelium and

ryegrass growth. Overall, with the garden giant present in the soil there was a smaller yield of ryegrass. This suggests that instead of a symbiotic relationship forming, there may have been competition for nutrients. The hypothesis was refuted but nevertheless the data showed the optimal conditions for ryegrass growth. The perennial ryegrass prefers soil that is slightly acidic, has high salinity, and high nitrogen content; traits that were absent in the contaminated soil but present in the potting soil.

ENV – 4 SHADY HERBIVORES: THE EFFECT OF URBANIZATION ON HERBIVORY RATES

Kashem Moomitu (HS),[1] Jung Emily,[2] Cullen Aiden[3]
[1] Midwood High School, Brooklyn, NY. [2] Brooklyn Technical H.S, Brooklyn, NY.
[3] Fordham University, Bronx, NY

This research demonstrates that herbivores may actually benefit in an urban setting because there are fewer predators than in a naturalized setting. We studied the effects of urbanization on herbivory rates by measuring percent surface area lost (SAL) of two species: black-eyed susans Rudbeckia hirta), and wild bergamot (Monarda fistulosa). We conducted observational research in two plots, a naturalized and urban plot at two sites, Prospect Park and Bronx Zoo. We found that in Prospect Park, rates of herbivory increased as canopy coverage increased. This demonstrates the relevance of canopy coverage for herbivores in any setting, but this link is especially interesting given that we found increased canopy coverage in the more urbanized plot.

ENV – 5 SYNTHESIZING LEAD PHOSPHATE USING ROCK PHOSPHATE AND TRIPLE SUPERPHOSPHATE TREATMENTS IN MUSTARD GREENS

Osarhuwense Otasowie (HS),[1] Dr. Zhongqi (Joshua) Cheng,[2] Zulema Garcia[2]
[1] Midwood High School, Brooklyn, NY
[2] Department of Earth and Environmental Sciences, Brooklyn College

The synthesizing of lead phosphate was conducted in order to decrease the synthesizing of lead arsenate. There were two major goals in this experiment. One was to stabilize lead in the soil by forming the compound lead phosphate. The other goal was to conclude which form of phosphate worked the best, which was between rock phosphate and triple superphosphate. In the preceding years, lead-arsenate pesticides in the United States were used, which have resulted in elevated soil lead and arsenic concentrations in farms. As a result, human exposure to toxic trace metals and has become a major health concern. Mustard Greens were grown using different forms of phosphate over the course of four months. The leaves and soil were collected after the experiment to conduct further research. Phosphorus was proven to decrease the amount of arsenic in the mustard green soil. This information can help researchers in the future determine the types of elements or treatments that can be used to decrease the amount of arsenic in the soil. Also, this can bring us one step closer to a solution of the toxicity of lead arsenate.

ENV – 6 THE CORRELATION BETWEEN SOIL CHARACTERISTICS AND CO2 LEVELS IN URBAN SOIL HORIZONS

Asia Q. Le (HS), Midwood High School, Brooklyn, NY and Dr. Hermine Huot, Brooklyn College, Brooklyn, NY

There is little knowledge about soil respiration in soil horizons below the surface. Much is known about the topsoil because it is where plants are grown. Deeper soil horizons remain a mystery to the scientific community. Soil itself is not living because it is only made up of minerals and nutrients, but there are

many microorganisms in soil that perform cellular respiration in soil. Cellular respiration yields CO_2, therefore, soil horizons that have higher CO_2 levels have more soil respiration. Soil respiration is instrumental to plant health; without CO_2, plants would be unable to perform photosynthesis. Soils were sampled from soil horizons in pits dug in various locations found in urban areas. Afterwards, soil respiration was tested using the Basal method. The Basal method is advantageous because it allows for fresh testing on soils; this means that all microorganisms are present and nothing is disturbed. The CO_2-Burst method allows for control over water content. This is optimal since water holds an instrumental role in cellular respiration. pH and salinity tests were also done. An XRF gun was used in order to detect the heavy metal content of the soil. DNA extraction was done to find out the concentration of DNA in each soil horizon to find a relationship between the concentration of DNA and total amount of soil respiration in each soil horizon. The tests showed that there was a higher CO_2 level in the mainly the topsoil than in any other soil. DNA extraction data shows that there was more microorganism DNA in the topmost soil horizon than in any other soil horizon. This backs up the hypothesis that more microorganisms yield more CO_2. Finding out more about these influences is incredibly important; healthier urban creates agricultural advances in urban areas.

ENV – 7 URBAN SOILS: HEAVY METAL CONTENT OF ARTIFACTS

Kai Saunders (HS),[1] Dr. Hermine Huot,[2] Dr. Zhongqi (Joshua) Cheng[3]
[1] Midwood High School, Brooklyn, NY
[2] Brooklyn College, Brooklyn, NY
[3] Department of Earth and Environmental Science, Brooklyn College, Brooklyn, NY

Urbanization, the population shift from rural to urban areas, is changing our developing world. For the first time in history, more than half the world's population resides in the cities. The trend towards urbanization is only accelerating exponentially. Runde (2015) explained that although urban growth provides tons of benefits such as the opportunity to connect millions of people to water and electricity, and building a healthier and more productive world, consequences such as infrastructure and changed soil conditions are also brought along. Urban areas are often in direct contact with pollution and traffic, which causes contamination in the soil (Morel, 2005) and also leads to changes in the properties of the soil. This project specifically focused on soil from one soil site and tested for the metal content from the different horizons. The project consisted of testing the two artifacts, which are among the most commonly found, slag and coal, and comparing it to the fine fraction (Shaw, 2010). After the separation and grinding of artifacts, the artifacts were then tested for their heavy metal content using the XRF machine. The results were then compared to the NYSDEC soil cleaning objectives. The data shows that specifically the element Cr has surpassed the SCOs. The end result indicates that urbanization does in fact affect the metal content in artifacts, thus posing a physical threat for people in surrounding areas.

ENV – 8 THE EFFECT OF H2O2 ON URBAN SOIL AND MUSHROOM GROWTH

Jinyan Huang (HS), Midwood High School, Brooklyn, NY

The purpose of this research is to test three different quantities of hydrogen peroxide or H_2O_2, and the effectiveness of this mild oxidizing agent to remediate the soil from North Henry Street which is located along Newtown Creek, one of the largest industrial waterways in NYC with pollutants being taken out by commercial vessels daily. Therefore, mycoremediation, a process of using fungi to degrade and isolate contaminants in soils, is used to improve the environment. Stropharia rugosoannulata or Garden Giant mycelium was used in addition to H_2O_2 to further remediate the soil. In this experiment, 50 mL and 200 mL of H_2O_2 were added to plastic containers with 400 g of North Henry Street soil and soil with no H_2O_2 as the control group. Each quantity was repeated four times. The amount of H_2O_2 added to soil

was determined by the organic matter analyses since H2O2 reduces the organic content in soil. Soil was analyzed through several tests including pH, salinity, and NPK tests. In addition, weight and observations were taken once every week and the experiment lasted about six weeks. The hypothesis was supported that the soil with 200 mL of H2O2 would greatly reduce the contaminants in soil because most of the samples with 200 mL H2O2 started to regenerate Stropharia rugosoannulata mycelium during Week 4. Mushroom mycelium growth is greatly impacted by the condition of the soil. Soil needs to provide enough nutrients to the mycelium, have an appropriate amount of moisture, and a low pH soil in order to increase the life span and growth of the mycelium. This experiment shows the use of H2O2 would be an economic method to improve the environment and reduce contaminants in soil.

ENV – 9 EXAMINING THE ENVIRONMENTAL HISTORY OF THE CENTRAL BALKANS

Jessica Khaimova (UN),[1] Charuta Kulkarni,[2] Rebecca Boger[1]
[1] Dept. Earth and Environmental Sciences, Brooklyn College
[2] Department of Earth and Environmental Sciences, CUNY Graduate Center

The purpose of this study is to examine the geochemical signatures of a sediment core extracted from a lake located in central Serbia. X-Ray Fluorescence (XRF) was used to determine elemental abundances of the sediments. Measurements were taken every 1 cm and plotted in graphs using Matlab and Excel. This core was selected since radiocarbon dating of wood, seed and plant material provided an age-depth curve while pollen analysis was carried out to show how the plant communities have changed over time. The oldest sediments are estimated to date back to 1100 CE. Selected elements were grouped into pollution indicators and erosion indicators. Pollution indicators include Pb, Zn, Cu, and As which are often added to sediments through mining and industrialization while the elements K, Ti, Fe, Ca, and Rb are used to indicate lithogenic inputs in the catchment. Geochemical analysis coupled with pollen analysis and C-14 dating allow to reconstruct the past environments in this region including the major climatic intervals - Medieval Climate Anomaly (MCA), Little Ice Age (LIA), and Industrial Era. Questions driving this research are: How has the Balkan landscape and its vegetation component changed across time? How do these changes fit with the three major climatic intervals and climate variability, in general? Since there is a long history of human activity in the study area, how have people altered the landscape during this period? Preliminary results of the geochemical analysis of Central Serbia reveal five major geochemical episodes. During the MCA, the pollution and erosion indicators are decreasing. During the LIA, the pollution indicators remain stable while the erosion indicators increase. The pollution and erosional indicators both decreased during the Industrial Era.

ENV – 10 A GIS ANALYSIS OF THE DEMOGRAPHICS AROUND COASTAL IMPOUNDMENT ALONG THE EAST COAST, US

Samantha Cohen (UN), **Travis Adams** (UN), Alexandra Gillis, Dylan Tobia, Urban Sustainability, Brooklyn College and Rebecca Boger, Department of Earth and Environmental Sciences, Urban Sustainability, Brooklyn College

Coastal impoundments are enclosed (usually diked) areas adjacent to tidal waters, within which water levels are actively managed to benefit wildlife. Many of these structures were built between the 1930s and 1960s as natural sanctuaries for migrating birds. In addition to wildlife habitat, they provide protection from storms, tidal surges, and rising sea level as well as places for people in urban settings to engage with nature. Now, many are in disrepair. Recently, the New Jersey Audubon Society (NJAS) received funding to assess where these impoundments are, how well they are functioning, how people value them, and ultimately to make recommendations on how to restore, manage and conserve. As part of this larger initiative, our project seeks to identify and analyze the demographics of residents

surrounding 166 coastal impoundments between North Carolina and Maine. Using Geographic Information Systems (GIS) and US Census data downloaded from the American Fact Finder site, we analyzed the demographics (age, median income, and percentages of race) within a 10 km buffer around the impoundments. We divided the entire study area into 4 regions to distribute the workload. GIS analysis methods were devised to standardize our approach; results were then brought together for the final analysis. We found that for the entire region, there were higher percentages of whites living nearby, population density varied greatly, median income ranged between $30,000 and $80,000, and that the population tended to be older, although there are a few exceptions. Our work will help NJAS identify which impoundments are in need of the most attention, along with survey and environmental data they are collecting as part of the larger project. The regional and overall results will be discussed.

ENV – 11 HOW CLEAN ARE COMPOST

Victor M. Flores (UN), Research Assistant, Earth and Environmental Science, Brooklyn College

Urban soils are often contaminated with Pb persisting as the toxin with the most health implications. Urban agriculture activities may increase human health risks, especially for young children. Municipal solid waste from kitchens and yards are compost all over the city. Compost lifts soil C/N ration, and aggregate stability levels by creating cations. Because of compost's amendment benefits, many urban agriculturalists are applying to minimize soil contaminants. However, raw organics used in composting can be a source of heavy metal since contaminants can be carried by wind and water. Heavy metals often are stabilized by microbial work while organic waste decomposes, but after compost enters to the soil, contaminants' bioavailability can be modified by the interaction with soil, plants or rain. This paper hypothesizes that levels of heavy metal contaminants in municipal compost could be higher than commercial compost. That would allow us to understand better how clean are local composts and to categorize the type of contaminants, which could be trace to its source. Field work in the sites from which the compost samples are taken records the sources added to composting system. At the laboratory we will be using XRF, NPK kit, pH/salt, and moisture content to determine contaminants and nutrient levels. The objective of the study is to find compost samples with lower contaminants, to understand contaminant sources; to optimize composting protocols, and to be able to rehabilitate some of the contaminated gardens by building raised beds with the clean compost amendments.

ENV – 12 DESALINATION OF SALINE WATER VIA BATCH ADSORPTION WITH TEA LEAVES

Hilario Garcia (UN), Olga Kryvda, Abel Navarro PhD, Borough of Manhattan Community College

Our world is going through a water shortage due to inappropriate use of water resources, and the rise of seawater levels. This put in danger agriculture and access to drinkable water of our society. So far, solar power, reverse osmosis and electrochemical techniques are being used to produce potable water from seawater. Unfortunately, these methods are very expensive and demand special training, energy and large treatment plants. This study aims to use solid wastes such as spent chamomile, green tea and peppermint as filtration devises for the elimination of sodium chloride and other salts present in seawater from solutions. Sodium concentration will be monitored by using an Ion Selective Electrode. Different experimental conditions like flow rate, pH, adsorbent mass and salt concentration will be explored to maximize the elimination of salt from these solutions. Finally, seawater samples will be taken from Coney Island beach and Hudson River (Manhattan) to test the real application of this methodology. Sodium uptake will be monited by instrumental techniques to demonstrate and elucidate the adsorption mechanism.

[not participating] **CHEM – 1 DEVELOPMENT OF AN EFFICIENT SYNTHESIS OF TRIFLUOROMETHYLATED ALKYNES AND THE PURIFICATION OF PRODUCTS PRODUCED FROM REACTIONS WITH VINYLKETENE COMPLEXES**

Nga Ying Lo (HS)[1] and Wayne Schnatter[2]
[1] Midwood High School, Brooklyn, NY
[2] Department of Chemistry and Biochemistry, Long Island University

Pharmaceutical companies consistently research for new methods to synthesize drugs, and depend on chemists to develop chemical compounds that are used to make drugs' precursors. The goals of this research are to develop an efficient synthesis of trifluoromethyl alkynes— which are responsible for synthesizing drugs used to treat neurological diseases—specifically triethyl-trifluoro-propynylsilane, and to study the compound's characteristics after it is reacted with vinylketene complexes. In this research, aryl iodides such as para-iodoaniline, para-iodo N,N-dimethylaniline, and para-iodoanisole are made in preparation for the Negishi coupling reaction with triethyl-trifluoro-propynylsilane, produced from Brisdon's method of trifluoromethylation. Whilst para-iodo-N,N-dimethylaniline, para-iodoanisole and triethyl trifluoro-propynylsilane give low yields of 15%, 12% and 15%, respectively. Para-iodoaniline gives a yield of 46%. In addition, triethyl-trifluoro-propynylsilane is reacted with 2-ethoxy-3 phenyl vinylketene complex in a cycloaddition reaction. The products resulted from the reaction are a mixture of compounds. Thus, further improvement must be done on the process of cyclization of vinylketene complexes with triethyl-trifluoro-propynylsilane, and the exact yields could not be determined.

CHEM – 2 THE INFLUENCE OF IONIC SIZE ON THE DIFFERENTIAL CAPACITANCE OF METAL/ELECTROLYTE INTERFACE

Yassine Mouaddab (UN), Brooklyn College, Brooklyn, NY and Mark Kobrak, Department of Chemistry, Brooklyn College, Brooklyn, NY

Electrified interfaces are of vital importance in problems ranging from energy storage systems to lipid bilayers, yet many fundamental questions about their nature remain unanswered. In this study, we take a recently-developed analytical model that describes a charged interface in an electrolyte and use it to understand how ionic size affects the capacitance associated with charging the interface. The theory is based on the Poisson-Boltzman lattice gas model that incorporates ionic size as a parameter, and permits calculation of the capacitance as a function of ionic size and applied potential. We are able to determine trends in capacitance as a function of potential and ionic size, and observe that surface screening is most efficient for small ionic radii. We also observe that the maximum in the differential capacitance depends strongly on ionic size, suggesting strategies for optimization of device performance. This shift may be experimentally measurable.
Supported by LSMAP

CHEM – 3 CYCLOPEPTIDE INHIBITORS OF POLYCOMB REPRESSIVE COMPLEX 2

Khadija D. Wilson (UN), Brooklyn College and Flavia Barragan, and Guillermo Gerona-Navarro, Department of Chemistry, Brooklyn College

The Polycomb Repressive Complex 2 (PRC2) groups of proteins are key epigenetic regulators of cell identity, determination and maintenance. These proteins mediate their function by catalyzing trimethylation of histone 3 at lysine 27 (H3K27me3), which results in silencing of tumor suppressor genes leading to cancer cell proliferation. PRC2 is composed by four major subunits: Ezh2, Eed, Suz12 and Rbbp4. Ezh2 contains the catalytic SET domain, however, all members of the complex are critical for its enzymatic activity, since Ezh2 does not methylate H3K27 by itself. Indeed, disrupting the complex

formation has proven an effective way of inhibiting its catalytic activity, and thus cancer cell growth, making this strategy an attractive alternative for future development of novel epigenetic cancer therapies. This project aims to explore this idea, by designing and synthesizing cyclopeptide inhibitors of PRC2 function that target specifically an intramolecular interaction of two important Ezh2 domains (SANT1L and SANT1L-binding domain). Our hypothesis is that these cyclic peptides will selectively bind to the SANT1L domain of the Ezh2, thus disrupting the complex formation and its catalytic activity. These cyclopeptide inhibitors could be useful not only as novel anticancer agents but also to study the role of this intramolecular interaction in PRC2 function in cancer biology.

CHEM – 4 SYNTHESIS OF PHENYL ACETYLENE-DERIVED-a-HYDROXYTROPOLONE

Jotty Francois-Fils (UN), Ryan Murelli, Alexandre Grigoryan, Department of Chemistry, Brooklyn College

HIV and hepatitis B are major human pathogens that require ribonuclease H activity for viral replication. For these reasons, ribonuclease H is a promising target for therapeutic development. One class of compounds that has shown promise at inhibiting this function for both viruses are a-hydroxytropolones. The Murelli lab has been exploring routes to access a diverse range of compounds, and this semester I synthesized one of these. Multiple reactions and purifications in sequences were performed to synthesize 7-hydroxytropolone with a phenyl appendage. These intermediates and ultimately the final compound were confirmed using H NMR spectroscopy.

CHEM – 5 EXAMINING THE SYNTHESIS AND INHIBITORY EFFECT OF CYCLIC PEPTIDES ON THE POLYCOMB REPRESSIVE COMPLEX 2

Chabely Rodriguez (UN), Flavia Barragan, Gan Zhang, Guillermo Gerona-Navarro, Department of Chemistry, Brooklyn College

The polycomb repressive complex 2 (PRC2) catalyzes histone 3 methylation, with specificity for lysine 27 (H3K27), a repressive histone mark responsible for silencing several tumor suppressive genes. Irregularities in this process are associated with cancer development; an idea supported by a large number of studies that link PRC2 components Ezh2, EED and SUZ12 to tumorigenesis, poor prognosis and tumor proliferation. Thus, inhibiting PRC2 function has emerged as an alternative strategy to develop novel epigenetic cancer therapies. The structure of the PRC2 complex has been recently elucidated. This structural information has provided insights into the different structural motifs of the PRC2 proteins that are involved in assembling the complex and in its catalytic activity. Using this information, our goal is to design and synthesize cyclic peptides that can competitively inhibit the association of the PRC2 complex, by specifically targeting a key intramolecular interaction of two EZH2 domains. The cyclopeptides reported have been synthesized on solid phase. The cyclization has been incorporated in order to lock the peptide in its bioactive alpha-helical conformation. These cyclopeptides could be useful to decipher the role of these particular protein domains in PRC2 function as well as in neoplastic development.

CHEM – 6 SYNTHESIS OF A NAPTHYL ESTER a-HYDROXYTROPOLONE

Lorie-Mae Nicolas (UN), Alexandre Grigoryan, Ryan Murelli, Chemistry Department, CUNY Brooklyn College, Brooklyn, NY, 11210

α-Hydroxytropolones are valuable pharmacological targets against several diseases. Reactivity of this molecule is attributed to their bimetallic enzyme inhibition through its oxygen triad. Although all α-hydroxytropolones share the same metal binding region, specificity of the molecule comes from varying

its sidechain. The Murelli research group developed an oxidopyrylium cycloaddition/ring-opening route to access a-hydroxytropolones and are using the strategy to optimize them against metalloenzymes, particularly those involved in HIV, Hepatitis B, and Herpes Simplex Virus infections. Over the last few years, the chemistry has been incorporated into a series of 4 hr laboratory style courses where students make a-hydroxytropolones. In this aspect, I synthesized an α-hydroxytropolone using 2-naphthyl propiolate as my starting alkyne (shown below), which I carried out through 3 synthetic steps. NMR analysis of the final product was consistent with expected product. This sequence is now being repeated to ensure reproducibility, and the product will be sent for biological evaluation.

PHYSICS – 1 EXPLORATION OF THE CONFORMATIONAL STATES IN EMIM FSA AND EMIM BF4 IONIC LIQUIDS

Sophia Suarez,[1] James Wishart,[2] David Cuffari,[1] and **Mahmoud Hamsho** (UN)[3]
[1] Department of Physics, Brooklyn College, CUNY Graduate School, New York, NY 10016
[2] Chemistry Department, Brookhaven National Laboratory, Upton, NY 11973
[3] Department of Physics, Brooklyn College, Brooklyn, NY 11210

High Pressure Nuclear Magnetic Resonance (NMR) is used to study the local dynamics and related conformational states of 1- ethyl-3-methylimidazolium (EMIM) bis(fluoromethylsulfonyl)amide (FSA) and EMIM tetrafluoroborate (BF4), ionic liquids. Measurements of NMR spin lattice relaxation times and self-diffusion coefficients as a function of pressure reveal changes in the cation and anion local conformations. Calculated activation volumes determined from the spin lattice relaxation times data show smaller value for the cation compared to the anion. This suggests differences in the short-range local motions. Activation volumes determined from self-diffusion coefficient data shows similar values, indicating comparable long-range motions. These results suggest an optimization of packing that is afforded by increasing pressure.

PHYSICS – 2 A VARIABLE TEMPERATURE STUDY OF THE EFFECTS OF ACID CONCENTRATION AND VANADIUM ION CONCENTRATION ON THE CONDUCTIVITY OF NAFION-117 PROTON EXCHANGE MEMBRANES

Domenec Paterno (UN),[1] **Andrew Sutjahjo** (HS),[2] Marco Ramirez,[3] Sophia Suarez[1]
[1] Department of Physics, Brooklyn College, Brooklyn, NY 11210
[2] James Madison High School, Brooklyn, NY
[3] Midwood High School, Brooklyn, NY

The vanadium redox flow-battery (VRFB) is an attractive candidate for storing energy derived from intermittent sources (e.g., wind, sun, water). The VRFB has a long cycle-life and independent power capabilities. Nafion has become a ubiquitous ion-conducting membrane due to high proton transport and high chemical, physical, and thermal stabilities. Accordingly, it has been the focus of additional research for its potential application in the VRFB as the electrolytic separator. The VRFB employs vanadium ions in sulfuric acid solutions as the anolyte (VO2+, VO2+) and catholyte (V2+, V3+). When Nafion is used in the VRFB, the cell efficiency suffers due to permeation of vanadium ions through the membrane. Our goal is to determine how the vanadium ions interact with the membrane through determination of the ionic conductivity using AC Impedance Spectroscopy. In this study, concentrations of both the solute (VO2+, VO2+) and solvent are varied. Temperature is varied throughout the common working range of the VRFB for the solute varied portion of the experiment only. Preliminary results on the VO2+ oxidation state show that for a constant solvent concentration (2H2SO4 + xxVOSO4), the ionic conductivity for imbibed Nafion-117 membranes decreased at all temperatures as the concentration of the electrolytic solute (vanadium) increased. For the constant solute solutions (0.2VOSO4 + xxH2SO4), the membrane exhibited enhanced conductivity at about 2.5M. These preliminary results suggest that optimization of the concentrations of the VO2+ vanadium-based solute and the sulfuric acid solvent may lead to effective and efficient operation of the vanadium redox-flow battery and allow for expanded use in commercial large-scale energy applications.

PHYSICS – 3 COMPARISON OF HEAT TO WORK CONVERSION IN FIRST ORDER AND SECOND ORDER MAGNETS

Azhar Bilal (HS), Midwood High School, Brooklyn, NY.

The purpose of my research project is to compare a first order ferromagnet and a second order ferromagnet to determine which one is the most efficient in terms of work output. Both a first order material (La-Fe-Si) and a second order material (CrO_2) were used. Literature data was used but it was viewed from an original perspective. The literature data was each material's magnetic saturation at different temperatures with varying magnetic field. The two materials were compared over a defined magnetic field range and temperature intervals relative to their Curie point (Tc). A surface plot was used to compare work output at certain temperature intervals and over changing magnetic field. It was difficult to compare the two materials since many factors had to be taken into account such as different Tc, difference in initial magnetic saturations, and different temperature ranges. It was concluded that La-Fe-Si the first order ferromagnet had a greater work output as it was predicted it would have. This project is important because it can confirm which material would be the best option to use in a pyromagnetic generator. A pyromagnetic generator is based on the pyromagnetic effect which can utilize low grade waste heat for power.

PHYSICS – 4 COMPARISON OF FIELD DEPENDENCE ON ENTROPY CHANGE IN FIRST ORDER AND SECOND ORDER MATERIALS

Laila Akallal (HS), Midwood High School, Brooklyn, NY

The main objective of this project was to compare the entropy changes and field dependence between La-Fe-Si (first order magnet) and CrO_2 (second order magnet) in order to observe which material would have the most efficacy for long term usage. The magnetization of these two materials under varying temperatures and magnetic fields was measured using a VMS and SQUID device. The magnetization was formed into a partial derivative of temperature with respect to a constant field. This derivation was then integrated with varying magnetic fields at some constant temperatures. This created integrals which were equal to the entropy changes. There were many temperatures provided for each material, but it was logical to only use the temperatures closest to the Curie point since that is where the most change in entropy would occur. These entropy changes were then graphed as a function of field at constant temperatures. Then maximum entropy change was graphed a function of maximum field. This helped find the magnetic field dependence on entropy change. As a result, La-Fe-Si had a linear field dependence which means it would be more favorable for long term usage.

PHYSICS – 5 MAGNETIC POWER GENERATION AND REFRIGERATION IN REVIEW

Zachary D. Forbes (GRAD) and Karl G. Sandeman, Department of Physics, Brooklyn College

Magnetic power generation (MPG) from waste heat has been experimented with for over 100 years, with the likes of Tesla and Edison proposing generator designs that used heat as the power source and ferromagnetic materials as the conversion materials. However, the technology has failed to break through. Until about 10 years ago, the magnetic materials considered or heat-to-power conversion were either expensive or rare. In addition, while low grade (100 ˚C) waste heat is abundant, the low Carnot efficiencies that are an upper bound on the efficiency of a device have not been sufficiently attractive to motivate widescale investigation. As a result, research in this area over the past century has been sporadic, and few prototype generators exist thus far. Recently, advances in solid-state magnetic refrigerants have spurred renewed interest in MPG since magnetic refrigeration is essentially the reverse of magnetic power generation, much as the Peltier effect and the Seebeck effect in electronic materials are corollaries of each other. The current state of play therefore necessitates a review of MPG research in order to find new ways to design and build magnetic power generators.

ENG – 1 MYEXOHAND

Max Miloslavsky (HS), Midwood High School, Brooklyn, NY

The exoskeleton robot system is a brand new type of human-robot cooperation system. It fully combines human intelligence and robot power so that robot intelligence and human operator's power are both enhanced (Lee, 2012). In this day and age we have many devices that help people deal with the challenges of daily life. One in five adults in the United States reported having doctor diagnosed arthritis (CDC, 2014). The machine we are creating is a human controlled hand exoskeleton that when it feels any small pressure it closes until it senses resistance. The exoskeleton hand is able to move each finger individually allowing not one to grasp a cup for example but also allows you to hold a pencil. This will help relieve millions of people from the pain of arthritis.

CIS – 1 DETERMINING PLANCK'S CONSTANT (6 x 10 exp -34) USING A YARD STICK AND TAPE MEASURE (9 x 10 exp -1)

Murray Gross, **Stephen Lin** (UN), Anthony Pervolarakis, **Daniel Singer** (UN), Department of Computer Science, Brooklyn College, Brooklyn, NY

In connection with work on substituting fundamental physical constants such as Planck's constant for physical objects as standards for weights and measures, the National Institute of Standards and Technology (NIST) has designed and is building a highly sensitive balance scale called a watt balance, which, instead of comparison with physical objects, uses measurements of electrical current to measure weight and mass. In turn, in connection with their work on a watt balance, NIST has also designed and implemented a miniature version of the watt balance that can be built by interested amateurs from LEGO bricks and other off-the-shelf components. Intrigued by NIST's claims that an instrument that uses a yard stick and tape measure (dimensions on the order of .9 meters) to calibrate an instrument with the potential to measure Planck's constant (dimensions on the order of 6 x 10-34 m2 kg/sec) to within 1%, we decided to build the miniature instrument from plans and photos provided by NIST. We found the NIST design to be cost prohibitive, and changed the design to reduce costs from an estimated $700 to about $200. Our efforts led us far afield from the unfamiliar computing we expected into unexpected areas of physics, electronics, and metrology. Here we present the progress achieved to date, and plans for future work.

CIS – 2 SYNTAX, SEMANTICS, AND COMPLEXITY

John Connor (GRAD), Brooklyn College, Brooklyn, NY

In this thesis we introduce the formal syntax and semantics of the programming language Sam, based on a larger research effort of Yanofsky [1]. Sam is a dependently typed lambda calculus, the terms of which describe certain constructions of category theory. We establish that Sam can construct a subset of "computable categories" and develop a lexical ordering of Sam programs which in turn gives us a hierarchy of categories, where the length of the shortest Sam program describing a categorical structure gives the "complexity" of the categorical structure.

CIS – 3 ACOUSTIC-PROSODIC ENTRAINMENT IN OUTLIER SPEECH

Robert K. Ip (UN) and Rivka Levitan, Department of Computer and Information Science, Brooklyn College, Brooklyn, NY

Human beings are the greatest communicators in the animal world, capable of exchanging complex ideas and thoughts through the subtlest changes in tone and inflection. Entrainment is the tendency of

human speakers to adapt to or imitate characteristics of their interlocutors' behavior to ensure maximum clarity of references. In human cognition, the processes of perception and production are closely linked, such that the fact of perceiving a behavior makes a person more likely to adopt it. We hypothesize that outlier speech - when a speaker's acoustic-prosodic feature deviates significantly from the norm - is more likely to be perceived and thereby imitated. In this study, we look for evidence of how outlier feature values affect global entrainment in the Switchboard-1 Telephone Speech Corpus, a collection of 2,400 two-sided telephone conversations among 543 speakers from all areas of the United States. Our analysis reveals that outlier speakers have higher relative entrainment than do normal speakers for jitter(ddp), jitter(local), and f0final, but not for other features.

CIS – 4 A SIMPLE ARTIFICIAL NEURAL NETWORK FOR OBSTACLE AVOIDANCE IN A KHEPERA II ROBOT

Stephan Kritikos (UN), Department of Computer and Information Science, Brooklyn College and Frank W. Grasso, BCR Lab, Department of Psychology, Brooklyn College, The Graduate Center at CUNY

Artificial neural networks have several advantages over traditional algorithmic controllers for robots. In particular they are real-updating, adaptive (capable self-adjustment and learning) and capable of graceful degradation of performance with much smaller memory-space footprints than similar functioning algorithmic controllers. Exploration Application of neural networks as a means to control motor movement allows for the end user to test neuron interaction in a repeatable, controlled environment. We programmed a robot controller in C++, which functions as an interface for the robot instructions to be used with a Biomimetic and Cognitive Robotics Lab neural network, also programmed in C++, to control the direction of a Khepera II mobile robot. It was able to use obstacle avoidance to navigate from one end to the other of an arbitrarily complex maze without interruption. Neural networks applied to mobile robots is both effective as a means of navigation through a non-static environment and as an efficient means of testing neuron interactions.

CIS – 5 GOBAL VERSUS LOCAL PRESSURE CONTOL OF SIMULATED MUSCULAR HYDROSTAT SOFT ROBOT SYSTEMS

Xin Guan (UN), Department of Computer Science, Brooklyn College and Frank W. Grasso, BCR Lab, Department of Psychology, Brooklyn College, The Graduate Center at CUNY

Soft robotics is a frontier area in the field that draws on the inspiration of elephant trunks and octopus arms as forceful and precision systems for dexterous manipulation of objects. The ABSAMS is a muscular hydrostat simulation system software that includes real-world physics to build and display muscular models inspired constituted from animal and artificial (robotic) systems. Shape changes in the individual elements produce shape changes in the entire ensemble in response to control commands delivered to the individual elements. Previous simulations operated based on local pressure adjustments at the points of command. The bulk modulus parameter meant that these simulations ran with impractical slowness. A theoretical insight suggested that global pressure changes would lead to faster simulations without compromised accuracy. We developed a global pressure calculation method for the ABSAMS simulator. The new code runs 100 x faster but produces different patterns of actuation. In conclusion, developing the pressure calculation algorithm does change the running speed. ABSAMS is able to run more complicated muscular models simulations. Ongoing studies involve validation of the results under the global pressure control method.

CIS – 6 INTERFACE BETWEEN THE SSC-32 CONTROLLER AND THE BOTBOARDUINO ON THE LYNXMOTION HEXAPOD ROBOT

Joyce Chiu (UN), Brooklyn College-CUNY and Frank W. Grasso, BCR Lab, Department of Psychology, Brooklyn College, The Graduate Center at CUNY

Legged robots are capable of locomotion over rugged terrain which makes them better suited for missions in unpredictable environments than wheeled or treaded mobile robots. The Lynxmotion hexapod robot has 24 df with 6 3 df legs and a gripper. Coordinating the legs and grippers for autonomous operations in unpredictable environments is a serious design and implementation challenge. The Lynxmotion hexapod has a dedicated SSC-32 servo controller microchip (slave) and a BotBoarduino (master) mission processor chip with different instruction sets. We intend on exploring real-time artificial neural networks as controllers for this robot. The SSC-32 servo controller is an actuator that functions as a mechanical joint on the Hexapod, ranging from a pulse width of 500uS to 2500us, which is equivalent to the angular positions of 0° to 180°. This project aims to create an interface between the SSC-32 servo controller and the BotBoarduino of the LynxMotion Hexapod Robot. This interface involves taking inputs from an artificial neural network that range from [0,1], and translating them to servo PWM (pulse width modulation) positions ranging from [500, 2500]. By developing a class which encapsulates the neural network input, the servo PWM position, and the unit speed, we can instantiate multiple servo objects corresponding to each of the 32 servo controllers on the Hexapod to receive inputs and output the desired position. This will allow multiple servo controllers to move at once. Such interface would mean that the robot will be able to move autonomously. With the creation and validation of this class, the next step is to place an artificial neural network on the robot to validate the performance of the interface and to observe the autonomous movement on the Hexapod.

CIS – 7 STEREOTYPICAL FEMALE LANGUAGE IN ACTUAL VS MOVIE DIALOGUE

Rivka Levitan, Department of Computer Science, Brooklyn College and **Monika Ciecka** (UN), Brooklyn College

We automatically identify instances of the linguistic phenomena put forth by Robin Lakoff as characteristic of "women's language," including hedges, profanity, formality, and tag questions, and measure their prevalence in female and male speech in two corpora. The first, taken from IMSDB, consists of over 600 screenplays; the second is Switchboard, a collection of spontaneous conversations between strangers. We show that the difference in use of these markers of "women's language" is greater between females and males in scripted conversations than between female/male interlocutors in actual conversations. Even if these markers are not necessarily, as Lakoff suggests, indicative of powerlessness, such a difference between movie and actual conversations indicates a portrayal of female speech drawn primarily from stereotype.

CIS – 8 LIPID BINDING DOMAINS OF ARABIDOPSIS THALIANA PHOSPHOLIPASE D

Carlos Bareto, **Kamrun Begum** (UN), **Alexis Cataldo** (UN), Giancarlo Franscisco, Ekaterina Karpova, Brooklyn College

Eukaryotes possess an intricate membrane system, consisting of many structurally discrete proteins and lipids that serve as interaction sites with lipid binding domains of soluble proteins.

The C2 domain is one such domain. This membrane-targeting domain prevails among eukaryotes and is in combination with other domains. The focus of this study is to analyze the C2 domains of the Phospholipase D(PLD) isoforms of Arabidopsis thaliana and investigate their potential roles and mechanisms in targeting PLD proteins to the cell membrane. Knowledge gained in this research would be a contribution to the limited literature on plant membrane binding domains. As a part of this study, we have analyzed the sequences of the six PLD classes and modeled three dimensional structures of their lipid binding domains. Domain architecture analysis revealed the presence of C2 domains coupled with the catalytic domains of the alpha, beta, gamma, delta, and epsilon isoforms. The PLDP1 and P2 isoforms house Pleckstrin homology(PH) and Phox homology (PX) domains with their catalytic domains instead of C2 domains. It is intriguing that PH and C2 domains are distinct domains with low sequence similarity, yet both exhibit lipid-binding functionality and structural overlapping. The core structure of the C2 domain is an anti-parallel eight-stranded β-sandwich, with four strands on each β-sheet, and the structure of PH domain is an antiparallel β-sandwich with seven β-strands and an α-helix at the C-terminal end of the domain. Here we present the results from the analyses of the theoretical models of the various lipid binding domains from the PLD isoforms of Arabidopsis thaliana. This will form a foundation to examine the evolution of the different membrane binding mechanisms of PLDs in plants.

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> **CIS** – Computer Information Science
> **ENG** - Engineering
> **ENV** – Earth and Environmental Science
> **HNS** – Health and Nutrition Science
> **PHYSICS**
> **PSY** – Psychology
> **SCAS** – Speech Communication & Arts Sciences