Science Research Day

ABSTRACT BOOK

Brooklyn College The City University of New York

MAY 9, 2014

24ᵀᴴ 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 ABNORMAL PARASYMPATHETIC REACTIVITY AND AGGRESSION IN CHILDREN

Wei Zhang (GRAD) and Yu Gao, Graduate Center and Brooklyn College-CUNY, Brooklyn, NY 11210

Despite growing interest in conceptualizing aggression as involving emotion dysregulation, few studies have examined if proactive and reactive aggression are differentially characterized by abnormal parasympathetic nervous system (PNS)-related cardiac activity in relation to disrupted emotion regulation. In a sample of 92 8-and 9-year-olds (54 boys), the current study examined proactive and reactive aggression by using the Reactive and Proactive Questionnaire (RPQ, Raine et al., 2006). PNS activity was assessed via respiratory sinus arrhythmia (RSA) in a baseline condition and during an emotion-evoking movie-watching task (i.e., negative induction, negative suppression, positive induction and positive suppression). Results showed that baseline PNS activity was not related to any subtype of aggression. Proactive aggression was linked to elevated PNS reactivity (i.e., RSA decrease or vagal withdrawal) in response to negative induction and positive suppression conditions, whereas reactive aggression was not linked to PNS reactivity. Findings suggest that proactive aggression is characterized by an abnormal PNS reactivity related to emotion regulation and add additional support for the distinct biological etiologies underlying proactive and reactive aggression.

PSY – 2 SEEING RED WITH HAPPINESS OR ANGER? METAPHORICAL COLOR REPRESENTATIONS OF EMOTIONAL CONCEPTS IN ENGLISH, CHINESE, AND ENGLISH-CHINESE SPEAKERS

Miriam Feintuch [1], **Kuen Chan** [1] (GRAD), Junqing Chen [2], Yingjun Chen [3], Nianyang Wu [3], and Natalie Kacinik, [1, 2]
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This project was designed to examine whether 1) the linguistic experience of individuals from English or Chinese language backgrounds can result in different metaphorical representations in those speakers; and 2) if there are distinct metaphorical representation systems in the minds of English-Chinese bilingual speakers, can they be differentially activated by the corresponding language context. In study 1, four groups of participants (English and Chinese monolinguals, and English-Chinese bilinguals presented with the questionnaire in either English or Chinese) rated the strength of 132 color-emotion pairs (11 colors* 12 emotions) on a 7-point scale ranging from "0 = No Relationship" to "6 = Extremely Strong". The current data show that the patterns of rating are different between English and Chinese monolingual groups, corresponding to some hypothesized differences in their color-emotion metaphors. Moreover, for English-Chinese bilinguals, their rating pattern was more similar to that of English monolinguals if they did the questionnaire in English, but more

similar to that of Chinese monolinguals if the questionnaire was done in Chinese. In study 2, we used the Brief Implicit Association Test (BIAT) to measure how strongly primary colors are associated with anger, sadness and happiness. Preliminary data, collected from native English speakers, support our hypothesis that red associates with anger and blue associates with sadness in English speakers' mental representations of emotion. Our findings therefore demonstrate that metaphorical color-emotion representations are different between English and Chinese speakers, and that language context may be the cue to activate corresponding mental metaphorical representations in bilinguals.

PSY – 3 PSYCHOPHYSIOLOGICAL VERSUS VERBAL RESPONSES IN COLLEGE STUDENTS WITH PSYCHOPATHIC TRAITS

Kerrie Lowenthal (UN) & Yu Gao, Department of Psychology Brooklyn College- CUNY Brooklyn, NY 11210

Psychopathy encompasses numerous aspects that we have yet to comprehend. There has been some research done to find out if a person with these tendencies has the capability to recognize the emotions of other people. Very little research has been performed in order to see if they understand their own personal body sensations. It was hypothesized that people with psychopathic traits have a mismatch between personal subjective verbal responses and objective physiological responses. One hundred and ten male and female Brooklyn College students were enlisted to partake in this study. Psychopathy traits were measured using the Psychopathic Personality Inventory-Short Form (PPI-SF) and the Levenson's Primary and Secondary Psychopathy Scale (LPSP). Skin conductance levels and heart rate measurements were taken while participants were presented with fifteen different dilemmas. During this task participants would have to decide how they would have reacted if placed in the situation. As hypothesized there was a mismatch between the verbal responses and physiological responses of those with high Psychopathic traits.

PSY – 4 SHARING GOOD NEWS

* **Camille Gregory**, * **Andrea Ramos** (UN), Cheryl Carmichael, Department of Psychology, Brooklyn College
*Authorship order was determined alphabetically; the first two authors contributed equally to this project

Disclosing good news to close others has important implications for relationship quality and personal well-being. However, sometimes one individual's good news may have negative implications for their relationship with a close other. This research examines the disclosure process for ambiguous positive events -- ones that may pose a threat to relationship stability. Participants (n=216) were asked to recall a time when they disclosed either a relationship-threatening or non-threatening positive event to either a romantic partner or close friend. Consistent with our hypotheses, relationship-threatening positive events produced higher levels of negative, and lower levels of positive felt emotions. Moreover, participants were less likely to express positive emotions when disclosing threatening versus

non-threatening positive events to romantic partners and friends. These findings suggest that when disclosing relationship-threatening good news, sharers may consider the negative relationship implications and display sensitivity when revealing this type of news to a close other.

PSY- 5 PREADOLESCENCE

Abraham Dickey III [1] (UN), Deborah Borlam [2], and Yu Gao , [2] *York College-CUNY, Jamaica, NY; Brooklyn College-CUNY, Brooklyn, NY*

Emerging throughout early childhood or adolescence, psychopathy is a recalcitrant clinical construct that is very similar to antisocial personality disorder. It is usually preceded by a formal diagnosis of conduct disorder prior to 18 years of age. Following its emergence from gene-environment interactions, psychopathy exhibits a variable constellation of personality, psychophysiological, endocrine, and neurobiological abnormalities, alongside aversive psychosocial characteristics including routine amorality, social deviance, predatory aggression, and extreme narcissism. In addition, tendencies toward criminality and other maladaptive behaviors can be reliably detected among children ages 6 through 13 by psychometrically evaluating three pivotal subscales – impulsivity (IMP), callous-unemotionalism (CU), and psychopathy-linked narcissism/pathological narcissism (PN) using the Antisocial Process Screening Device. Prior literature suggests that in adults PN is associated with aggressive behavior and that the different types of aggression (i.e. proactive and reactive) may be characterized by distinct psychophysiological profiles. In this study 253 eight and nine-year old boys and girls residing in Brooklyn, New York were recruited and their psychopathic traits and aggression were assessed. Results are: (1) after controlling for CU and IMP, PN is positively associated with both reactive and proactive aggression, and (2) among children with high PN, small heart rate reactivity during an emotion-evoking task is associated with high aggression. Findings extend the narcissism-aggression association in preadolescents, and suggest that less psychophysiological fluctuation may be linked to elevated aggression in general.

PSY – 6 THE EFFECT OF PHOTOSHOPPED ADVERTISEMENTS ON PEOPLE'S SELF-ESTEEM

Trung T. Phan and **Ahmad Usman** (HS), Abraham Lincoln High School

"Photoshopping" is the process of changing an image, often to remove a person's physical flaws or emphasize desirable characteristics. This method is used in advertisements presumably to persuade readers to emulate the models by using the products being advertised. The purpose of the current study is to see what types of people's self-esteem are affected by viewing photoshopped images, and by how much. A survey was administered in which people first viewed a set of photoshopped images and then answered questions about their height and weight (to determine BMI) and about how they felt about themselves after viewing the images.

Next, the participants were shown the "original" (non-retouched) versions of the photos with the photoshopped versions next to them for comparison. They once again took the body image survey. The majority of our participants did exhibit some change in their self-esteem scores before and after viewing the photoshopped and original photos. The people with a low BMI had a low score (indicating positive self-image) and change towards the better of their self-esteem, and the people with a greater BMI had a high score (indicating negative self-image) with change towards the worse of their self-esteem. Thus the hypothesis about the effect of photoshopped images on the self-image of adults was supported to an extent.

PSY – 7 DOES HEMISPHERIC DOMINANCE AND HANDEDNESS AFFECT ACADEMIC SUCCESS?
Mohammad Mahmud, Sikandar Cheema, <u>Calvin Li</u> (HS), Abraham Lincoln High School

Our group hypothesized that handedness and brain hemispheric dominance would affect academic success based on the popular thinking within our community that left-handers are gifted academically. We designed an experiment that first collected students' school grades to assess their academic skills. Furthermore, the participants took an IQ test to determine the students' intellectual abilities and two other surveys to determine their handedness and dominant brain hemisphere. Some of the data that we collected supported our hypothesis. With the data collected, we noticed that handedness did not affect many of the students' hemispheric dominance, as that part of the experiment shows no pattern or correlation. However, subjects' handedness did affect their IQ test results. Specifically, left-handers scored significantly higher on the IQ test compared to right-handed participants. This indicates that handedness does affect a person's academic skills in a major way.

PSY – 8 PREFRONTAL CONTRIBUTIONS TO METAMEMORY MONITORING AND ASSOCIATIVE RECOGNITION
<u>Alexandra M. Gaynor</u> [1] (GRAD), Lisa A. Solinger [2], Elizabeth Chua [1,2]
1. The Graduate Center, CUNY; 2. Department of Psychology, Brooklyn College, CUNY

Previous research has indicated that prefrontal brain regions may be involved in relational memory performance and metamemory monitoring. We investigated the causal role of the prefrontal cortex in both processes using transcranial direct current stimulation (tDCS) during the encoding phase of an associative recognition task, and hypothesized that prefrontal stimulation would result in enhanced memory performance, as well as a stronger correlation between memory performance and judgments of learning (JOLs). Twenty-eight healthy adults were randomly assigned to 20 min active (2mA stimulation) or sham tDCS conditions. During study, participants memorized word pairs and made JOLs for each pair. At test, subjects were shown pairs of words, half of which were studied as a pair (intact) and half rearranged, and asked to make an intact/rearranged decision. Preliminary t-tests revealed that in the active tDCS condition, memory performance for intact pairs was significantly lower than rearranged pairs ($p<0.01$), and intact pairs in the sham group ($p<0.05$), suggesting that tDCS may have actually hindered encoding for intact pairs. Gamma

coefficients and d_a values, measures of JOL accuracy, were significantly higher for intact pairs than rearranged in both conditions ($p<0.001$). In contrast to our hypotheses, these preliminary results suggest that prefrontal activity may be mediating only certain aspects of associative encoding rather than overall memory performance and metamemory judgments. Specifically, it may be involved in encoding relationships between stimuli, such as intact word pairs, which relies on both item and associative memory, rather than only the item memory needed for recognition of rearranged pairs.

PSY – 9 AUTONOMIC CONDITIONING DEFICITS IN CHILDREN WITH CALLOUS-UNEMOTIONAL TRAITS

Krystal Mendez (UN), Yu Gao, Hassan Naveed, Brooklyn College-CUNY, Brooklyn, NY

Previous studies suggest that along with impulsivity and narcissism, callous-unemotional traits are the key factors that contribute to behavioral problems in children with conduct disorder, and they are characterized by autonomic conditioning deficits. However, prior research has focused on conditioning deficits to punishment, and it is unknown if these children also show abnormal conditioning to rewards. The purpose of this study was to first examine the validity of the conditioning paradigm with money as reinforcers and also to relate the levels of conditioning by measuring skin conductance response (SCR) to callous-unemotional traits in 8 and 9 year-old children. The study examined 167 boys and girls living in Brooklyn, NY and their callous-unemotional traits were assessed using the Inventory of Callous-Unemotional Traits. Results showed that (1): Both the rewards (i.e., gaining money) and punishment (i.e., losing money) resulted in larger SCRs than the neutral stimulus, and there was no difference between responses to the two reinforcers; (2)The participants who had reduced conditioning to the rewards scored higher on uncaring traits, and children had deficient conditioning to the punishment scored higher on the unemotional traits. Findings suggest that money as a reinforcer can be successfully used to elicit conditioning in 8-9-year old children from a community sample, and that autonomic conditioning deficits to rewards or punishment are associated with different aspects of callous-unemotional traits.

PSY – 10 ATTACHMENT ORIENTATION AND PREFERENCES FOR PHYSICAL CONTACT

Rena Li (UN), City College, Cheryl Carmichael, Brooklyn College

Engaging in physical contact with a romantic partner communicates affection, care, and concern. Attachment style, an individual difference variable characterized by comfort with closeness (attachment avoidance), and feeling of love-worthiness (attachment anxiety), should dictate willingness to engage in physical contact. This research was conducted to investigate whether there is a relationship between self-reported attachment style and comfort with physical contact. 427 participants reported on their attachment style and their preferences for various forms of physical contact including how much they enjoy it, how much they engage in it, how much they would like to engage in it, how important it is to a relationship, and their tendency to initiate it. Attachment anxiety was associated with

decreased engagement in physical contact but increased desire for engagement in physical contact, and an increased likelihood to initiate physical contact. Attachment avoidance was associated with decreased enjoyment in, engagement in, and desire to engage in physical contact. Attachment avoidance was also negatively associated with a belief that physical contact is important to romantic relationships. These results suggest that the benefits of physical contact may be dependent on a person's attachment orientation.

PSY – 11 KNOWING YOU KNOW: A TRANSCRANIAL DIRECT CURRENT STIMULATION STUDY OF THE PREFRONTAL CORTEX IN THE FEELING-OF-KNOWING.

Shanique Meyler (UN), Elizabeth Chua, Department of Psychology, Brooklyn College-CUNY

Sometimes when people fail to recall information, they nevertheless have a feeling-of-knowing (FOK) that the non-recallable information is known or can be remembered later. Previous fMRI studies have shown an increase in prefrontal activity with increasing levels of FOK. Because fMRI is correlational, the aim of this study was to use transcranial direct current stimulation (tDCS), a non-invasive form of brain stimulation, to test whether the prefrontal cortex (PFC) has a causal role in the feeling-of-knowing. In 2 experiments, participants were presented with 180 name-face pairs. Following study they either received active or sham stimulation. At test they were presented with a face and asked to recall the name. Following recall they made a FOK judgment on a scale of 1-6 if they believed they would recognize the correct response on a subsequent recognition test. They were then asked to choose the correct name among three alternatives (1 correct, 2 incorrect). In Experiment 1, the anode was placed at F3 and the cathode over the supraorbital ridge, which is thought to lead to excitation of the dorsolateral PFC. Contrary to our hypothesis, participants (n=24) gave significantly lower FOK judgments for face-name pairs that were later correctly recognized during active compared to sham stimulation (p<0.05). In Experiment 2, the anode was placed over the supraorbital ridge and the cathode over F3, which is thought to lead to inhibition of the dorsolateral PFC. Preliminary analyses (n=16) showed no significant difference in average FOK during active compared to sham stimulation. Experiment 1 suggests that the PFC plays a causal role in FOK judgments, but it is currently unclear whether reversing the polarity of the stimulation (Exp. 2) will also show changes in FOK judgments once a larger sample is obtained.

PSY – 12 THE RELATIONSHIP BETWEEN BASIC MATH SKILLS AND PERFORMANCE IN PSYCHOLOGY STATISTICS COURSE: CONSIDERATIONS FOR ENHANING STUDENT ATTIDUES AND ACHIEVEMENT

Andrew Lerman (UN), Farnia Naeem, Lorin Berman, & Laura Rabin
Department of Psychology, Brooklyn College of The City University of New York

Undergraduate statistics is a required class for various degree programs, though many students struggle, in part, due to weak basic math abilities. Because statistics courses are

relatively high in mathematics content, core math skills have an important impact on performance. Unfortunately, such skills are not routinely assessed or remediated by statistics instructors. The present study investigated the relationship between mathematics competency and grades in an undergraduate psychology statistics course. Undergraduate students (n=191) enrolled in two semester-long psychology statistics classes completed a 40-item math competency quiz during the first week of class. We designed the quiz to test skills such as basic algebra, performing mathematical operations on decimals and fractions, and interpreting graphed data. Performance on the competency quiz was significantly correlated with performance on in-class exam 1 ($r=0.56$, $p<.001$) and exam 1 ($r=0.44$, $p<.001$), and results were maintained after controlling for number of hours spent preparing for exams. Results suggest that students with solid mathematical skills have better performance in a statistics course. The positive moderate correlation between basic math competency and performance has implications for remediation and improving student outcomes. Programs requiring students to complete statistics courses might benefit from increased attention to mathematics prerequisite courses and competencies.

PSY – 13 PEER TUTORING IMPROVES UNDERPEFORMING STUDENTS' GRADES IN UNDERGRADATUE PSYCHOLOGY STATISTICS

Lorin Berman (UN), Farnia Naeem, Nicole Belgrave, & Laura Rabin
Department of Psychology, Brooklyn College of The City University of New York

Peer tutoring can improve academic performance by enhancing the quality of the learning environment. It is especially helpful in difficult courses, such as statistics. The current project utilized peer tutors to assist undergraduate psychology students learn statistics at a well-adapted pace. Undergraduate teaching assistants served as peer tutors during two semester-long courses of undergraduate psychology statistics that enrolled 191 students. Because it was expected that weaker students would derive the most benefit from the tutoring sessions (offered approximately 4.5 hours per week), we restricted our analysis to the weak subset of students (n=77), operationalized as those who obtained a score lower than an 83 on Exam 1 (i.e., a grade of B- or lower). Attendance at the weekly volunteer tutoring sessions was recorded. Results indicated that there was a small significant correlation for total number of tutoring sessions attended between exams 1 and 2 and score on exam 2 ($rho=0.27$, $p<.05$). These preliminary findings encourage the use of peer tutoring in undergraduate math-based courses. Lower performing students can benefit from tutoring assistance because peer tutors convey material through a different perspective that may be more relatable and easier to understand. Additionally, peer tutoring is a cost-effective way to provide individualized instruction that can be adapted to the needs and pace of low-performing students. We hope to use the current results as a way to introduce peer tutoring into the broader psychology statistics curriculum.

PSY – 14 PSCYHOMETRIC PROPERTIES OF CLINICAL PROSPECTIVE OF A CLINICAL POSPECTIVE MEMORY TASK: RELIABILITY OF THE ROYAL PRINCE ALFRED TEST IN A COMMUNITY-DWELLING SAMPLE OF OLDER ADULTS

Hayoung Ryu (UN), Tangeria Adams, and Laura Rabin
Department of Psychology, Brooklyn College of The City University of New York

Recent studies have revealed a prominent prospective memory (PM) deficit in older adults with mild cognitive impairment, a preclinical stage of dementia. Despite the relevance of PM to older adults' real-world functioning and the potential of PM tasks to identify the earliest signs of neurodegenerative cognitive decline, PM tasks are not routinely utilized in neuropsychological assessments of older adults. With a limited number of PM tests available for clinical use, the Royal Prince Alfred Prospective Memory Test (RPA-ProMem; Radford et al., 2011) was developed as a brief measure of PM that includes both time- and event-based tasks measured over short- and long-term retention intervals. We investigated two aspects of reliability of the RPA-ProMem in a sample of community-dwelling, non-demented older adults (n=257; mean age=80.78; 67.7% female; 40.0% nonwhite). Inter-rater reliability was strong for RPA-ProMem total scores ($ICC=0.97$, $p<0.001$) and for the four parts of the RPA-ProMem ($ICCs>0.90$, $p<0.001$). Internal consistency reliability was comparably weak ($\alpha=0.501$) but is explained by the multidimensionality (i.e. construct heterogeneity) of the measure. Overall, the RPA-ProMem demonstrated adequate reliability, was well tolerated by participants, and was easily incorporated into our test battery. We offer suggested ways to improve the RPA-ProMem so that it may be used effectively with older adults with differing cognitive profiles in clinical and research settings.

PSY – 15 APPARATUS FOR STUDYING WHOLE-BODY OPTIKINETIC RESPONSE IN FIDDLER CRABS (*UCA PUGILATOR*)

Muhtasham A. Sifaat (UN), Stephen Volz and Frank Grasso,
Department of Psychology, Brooklyn College- CUNY, Brooklyn, NY 11210

In contrast to many crustaceans, fiddler crabs rely on a home burrow for mating and protection from predators. Homing to this burrow after foraging excursions or when threatened is important for the individual crab's survival. We and others have hypothesized that the visual system of the fiddler crab plays important roles in homing behavior by providing information about landmarks and external compass cues. Fiddler crabs are known to keep their eyes in line with external stimuli and adjust their body orientation to maintain this alignment. We sought to verify the existence of a whole-body optokinetic response in these Crabs. Crabs (n=3) were individually placed in a vertical drum of regular black and white stripes and their movements were recorded using an overhead video camera. We used video analysis to compute the voluntary rotation of each crab as the drum was rotated clockwise (30 seconds trial duration). We varied the speed of rotation (12, 24 and 36 deg./sec). We computed the correlations between the direction of rotation (clockwise, counterclockwise or none) of the crab and of the drum for each trial. We found a significant difference between the correlations across the three rotation speeds ($F(2,4) = 7.86$, p=

0.041). These results indicate that fiddler crabs exhibit a whole-body optokinetic response in our apparatus. Ongoing studies with this apparatus in these crabs will examine the roll of optokinetic response in crab's maintaining orientation as it relates to homing.

PSY – 16 FURTHER EFFECTS OF A HUMAN AUDIENCE ON THE CALLING BEHAVIOR OF MONK PARAKEETS (MYIOPSITTA MONACHUS)

Samuel Genchikmakher (HS) and Frank Grasso, Midwood High School, Brooklyn, NY 11210 and the Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

Audience effects often indicate the existence of higher cognitive abilities in social animals. Monk Parakeets *(Myiopsitta monachus monachus)* are gregarious, successful invasive species that are known to possess other higher cognitive abilities. In a previous study (Genchikmakher and Grasso BC Science Day 2013) we found that monk parakeets are sensitive to audience size. For that study we recorded the calls of monk parakeets at their nests following the arrival of a single person or a group of nine people. Here we increased our sample size and with the increased sample size, were able to determine whether the effect was independent of the number of birds present. We analyzed our recordings to determine the number of distinct calls per minute and percent of time the parrots spent vocalizing as a group (chattering). These measures were collected at one minute intervals for the 5 minutes after the audience arrived at the nest and looked directly at it. We also counted the number of parrots present at the nest during each observation. In this expanded study we confirm that the number of distinct calls made by the birds was higher when a group of nine people was present. We also extend our findings to indicate that this effect persists when we correct for the number of birds present. These results further support the idea that monk parakeets possess an audience effect and are sensitive to the size of groups of human observers. They also suggest that this effect may extend beyond groups of parrots to individual parrots.

PSY – 17 THE BROOKLYN POPULATION OF MONK PARAKEETS *MYIOPSITTA MONACHUS,* PREFERS *ROSACEAE,* FRUIT TREE WOOD FOR THE CONSTRUCTION OF NESTS

Tasnim Halim (HS) and Frank Grasso, BioMimetic And Cognitive Robotics Laboratory, Department of Psychology, Brooklyn College, Brooklyn, NY 11210

The monk parakeet population in Brooklyn poses threats to telephone and power lines through their nest construction activities. Their domed, freestanding multi-chambered nests are occupied year round by multi-family groups of monk parakeets. In an earlier study, we found evidence that monk parakeets preferred to include rare *Rosaceae* wood in the construction of their nests. (Halim and Grasso 2013, BC Science Day). Here we report on further studies of monk parakeet stick preference for nest construction. For this study, we added samples of sticks from three additional nests to our previous sample. These nests were completely disassembled and we made four different measurements on individual sticks from random samples from each nest. We scored the length, diameter, and weight of

individual sticks and identified them as originating from trees in the *Aceraceae, Ailanthus, Fagaceae, Hamamelidaceae, Leguminosae, Rosaceae, Simarubaceae* and *Ulmaceae* genera. In the augmented sample, we confirmed that *Rosaceae* sticks are disproportionately represented. We also found that the *Rosaceae* sticks that parrots included in their nests were significantly lighter in weight and thinner in diameter compared to all other genera. There was no difference in the lengths of *Rosaceae* sticks compared to other types of sticks. Thinner sticks provide less mechanical support but may also be easier for parrots to insert throughout the nest. The differences in the mechanical properties we found in our recent study provide additional evidence in support of our earlier hypothesis that *Rosaceae* sticks are included in monk parakeet nests for their action as parasite repellant.

PSY – 18 INVESTIGATION OF SPATIAL MEMORY IN JUVENILE AXOLOTLS (*AMBYSTOMA MEXICANUM*) IN AN INVERSE MORRIS WATER MAZE (NO CLUE WITHOUT A CUE)

Frank Grasso and **Zohaib A. Qazi** (UN), Dept of Psychology, Brooklyn College

Despite their important position in the evolution of the amniote brain, spatial memory has received limited investigation in amphibians. Axolotls (*Ambystoma mexicanum*) present a novel case as a neotenic species that reaches sexual maturity in the aquatic phase of its development. Our research seeks to investigate spatial memory in juvenile axolotls using a magnetic field beacon, where electrical current will be used to indicate the location of the escape hole in an "inverse" Morris water maze (IMWM). As a first step, however, we investigated whether the axolotls would find the escape hole of the IMWM in the absence of a cue. We predicted that if axololts possessed spatial memory experience of the IMWM, it would lead them to escape in less time and using shorter and more direct path lengths. Six axolotls were run for five trials each on the IMWM. We measured the time it took them to escape, their average velocity and how straight the animal moved. The animals in our study showed no significant differences in these measures. [Repeated measure ANOVA for time to escape, $F_{(4,20)}=.017, p=.999$, for average velocity $F_{(4,20)}=1.7, p>.189$, and for path straightness $F_{(4,20)}=.296, p=.877$.] We interpret these results conservatively, suggesting (without concluding the null) that in our design the axolotls lack guidance cues to find the exit. This pilot study serves as a baseline to future experiments. The next phase in our studies will be to include beacons like an electric field or a visual landmark.

PSY – 19 THE LINGUISTIC INFLUENCE OF DISEASE ACTIVITY AND ANXIETY SYMPTOMS ON PHYSICIANS' DESCRIPTION OF PATIENTS

Joel Cruz (UN) and Laura Reigada, Department of Psychology, Brooklyn College-CUNY, Brooklyn NY, 112210 remedied

The language doctors use to write about their patients is crucial for providing proper health care. Progress notes written by physicians contain valuable information regarding patients' health status, plans for treatment, prescriptions, and other case-specific material. The recorded information serves as a point of reference for other medical professionals to

properly aid and assess future care of the patient. In this study, the progress notes of 85 adolescents with Crohn's disease (CD) were analyzed to determine if patients' level of anxiety and disease activity influenced physicians' word choice. The Screen for Child Anxiety Related Emotional Disorders (SCARED), a self-reported measure to assess for anxiety, and the Harvey-Bradshaw Index (HBI), a measure for disease activity, were utilized. The computer program Linguistic Inquiry and Word Count (LIWC) scanned the notes for "anxiety words" (e.g., afraid, fear, nervous) and "negative emotion words" (e.g., sob, annoy, complain). Hierarchical multiple regressions were conducted for statistical analyses. Results demonstrated that higher symptoms of anxiety, but not disease activity, were predictive of a higher use of anxiety words (adjusted R^2 = .134, F (4, 80) = 4.257, p = .004). Furthermore, the severity of disease activity (adjusted R^2 = .095, F (3, 81) = 3.946, p = .011) and anxiety symptoms (adjusted R^2 = .159, F (4, 80) = 4.976, p = .001) were predictive of the use of negative emotion words. These results suggest that physicians are using anxiety and negative emotion words depending on anxiety symptoms and disease activity.

PSY – 20 LEARNING TO INHIBIT BEHAVIOR: THE ROLE OF THE PRELIMBIC CORTEX

Tangeria R. Adams [1,2] (UN), Heidi C. Meyer [2], & David J. Bucci [2]
[1]Dept of Psychology, Brooklyn College [2]Psychological & Brain Sciences, Dartmouth College

Deficits in inhibitory processes are associated with specific psychiatric disorders such as schizophrenia and attention deficit hyperactivity disorder (ADHD). In an animal model, previous research demonstrated that the prelimbic (PL) region of the medial prefrontal cortex (mPFC) is important for response inhibition during negative occasion setting, a learned inhibition task. In the negative occasion setting paradigm, rats with prelimbic lesions and adolescent rats with immature prelimbic cortices were significantly impaired on successfully discriminating between reinforced and non-reinforced trials compared to adult controls (MacLeod & Bucci, 2010). The current study investigated the role of the prelimbic legion on another type of learned inhibition task: conditioned inhibition. Subjects were 32 male Long-Evans rats (16 adolescents – PND 35; 16 adults PND 70). Neurotoxin (NMDA) was used to lesion the prelimbic region in 8 of the adult rats. Rats were given 12 daily sessions of 16 trials, 4 reinforced (10 second tone followed by food) and 12 non-reinforced (10 second compound light/tone followed by no food reward). Results indicated that the lesioned adult rats took significantly longer to discriminate between the trial types and withhold responding than did control group rats (p<.005). Similarly, adolescent rats showed significantly impaired response inhibition compared to normal adult rats (p<.005). Overall, these findings demonstrate that both types of learned inhibition tasks are sensitive to PFC damage and suggest that the prelimbic region is important for different types of inhibition. Identifying the neural substrates involved in response inhibition will improve scientific understanding of the behavioral consequences of abnormalities in these systems.

PSY – 21 FEATURE REVERSAL: A NEW TEST OF ASSOCIATIVE LEARNING THEORIES

__Goldy Landau__ (UN), Kinsborough Community College-CUNY, Kristie Tse, Brooklyn College-CUNY, Furness Norton, Brooklyn College-CUNY, Stefano Ghirlanda, Brooklyn College-CUNY and Stockholm University Center for the Study of Cultural Evolution

Theories of learning aim at elucidating how organisms utilize experiences to guide behavior in similar future conditions. Here we present results from a new experimental design, dubbed "feature reversal," aimed at contrasting two prominent theories of associative learning: the "replaced elements model" (REM) of Brandon et al. (2000), and the "configural model" of Pearce (1987, 1994). The experiment has two learning phases and a final test. The first phase consists of reinforced presentations of stimulus A; the second phase of unreinforced presentations of A intermixed with reinforced presentations of A together with a second stimulus B. In the test, responding to B alone is assessed. The replaced elements model predicts that responding to B at test will be less than responding to A at the end of phase one, while Pearce's model predicts the opposite. Crucially, the predictions are opposite for all values of model parameters, yielding an unambiguous assessment of the theories.

We ran the experiment using colored squares as stimuli A and B, presented on a computer screen. Sixty subjects, divided into three groups with varying similarity between A and B, where instructed that pressing the spacebar in response to some stimuli would cause a smiley face to appear, and that they had to learn to press solely in response to those stimuli which they thought would yield a smiley face. Thus the smiley face served to reinforce pressing the spacebar. The data collected support the replaced elements model across all groups.

PSY – 22 THE PREVALENCE OF MYOPIA IN ORTHODOX JEWISH MALE HIGH SCHOOL POPULATIONS: ASHKENAZI VS. SEPHARDIC

__Jake Sutton__ (HS), Magen David Yeshivah High School and Steven Kaye

An optometrist was asked about the prevalence of myopia in the Ashkenazi jewish male population and the response to the question was that she noticed a high percentage of myopia in the students in this population but was unaware of the cause.

A preliminary hypothesis was developed and a literature search was conducted. The literature revealed that Eastern-European male Jewish students in England were recognized as having a high prevalence of myopia and the paper was published in 1928.

An experiment was designed. Fifty random, volunteer students from a high school serving the Ashkenazi, Eastern-European community were designated as the experimental group and the fifty random, volunteer students from a high schools serving the Sephardic, Middle Eastern Jewish community were selected as the control group. They underwent an eye exam and completed a questionnaire.

The results of the questionnaire and eye tests were tallied and results were examined. In addition, as previous researchers discussed lighting conditions as a possible causative factor, measurement of light intensity were conducted in work areas in both schools.

The experiments yielded large differences in the frequency of myopia in the two populations. In addition, lighting conditions were similar in classrooms and study areas in both schools falling within the recommended lighting intensity for work areas.

Within the experimental population, 78% self-identified as wearing corrective lenses, while in the control group 38% self-identified as wearing corrective; lenses. The visual acuity tests also showed approximately a two to one ratio of myopia between these two populations.

PSY – 23 PROMPT OR COMPASSIONATE: WHAT MAKES A GREAT DOCTOR?

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A shift in the medical field has taken doctors away from practicing patient centered medicine toward a more bureaucratic system. Although this shift may increase profit margins, it is still unknown if the change will increase Americans utilization of preventative medicine. To understand what patients are looking for in a doctor, participants (N= 160) in this online experiment were asked to read a description of one of four doctors, described as either compassionate or neutral, and male or female. They then completed a series of questions regarding the doctor's competency and demeanor, and their intent to visit a doctor in the upcoming year. Participants also reported on how trusting they were. Results show that participants were significantly affected by the gender and compassion of the doctor, and were most likely to visit a doctor after reading about compassionate, female doctors. Trusting people were also more likely to visit the doctor. With these results, hospitals, doctors, and medical professionals should consider placing a greater emphasis on trusting relationships in order to ensure that patients will regularly visit their primary care doctors and, hopefully, lead more healthy lives.

PSY – 24 SAFETY SIGNALING IN PAVLOVIAN CONDITIONING

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Researchers are continually trying to find what treatment methods are most effective for coping with anxiety disorders. Learning safety signals may reduce individuals' anxiety levels by inhibiting fear and stress response. We created a safety signal via Pavlovian backwards conditioning where a white noise conditioned stimulus (CS) was presented after the offset of a footshock unconditioned stimulus (US). We were interested in determining what conditions promote a more effective safety signal by manipulating shock intensity and the temporal interval between the US and the CS. Half of the 32 Long-Evan rats were exposed to a weak intensity US (0.5 mA), while the other half was exposed to high intensity US (0.8 mA). Rats in each group were trained in a backward procedure where the CS followed the US at 2, 5 or 10 s later the US offset, these groups were compared to a control group whereby the CS and US were presented at random in a non-contingent fashion. Rats anxiety levels were measured by how often magazine responses to receive pellets were made throughout each 20 minute session and the effectiveness of the safety signal was determined via a

retardation test. Preliminary results indicated that a longer US-CS interval (5 s & 10 s) produced a stronger safety signal than a short interval (2s), and this effect was strongest with a weak US. This suggests that a safety signal produced after a traumatic event are more successful at reducing anxiety.

PSY – 25 OCTOPUS EXPLORATORY BEHAVIOR IN A Y MAZE?

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Octopus are marine invertebrates with complex learning capabilities and brains comparable in complexity to mammals. While studies of their cognitive abilities are abundant, studies of their use of space, particularly in the field, are rare. Given their documented use of dens in the field we hypothesized that octopus in the laboratory would learn to associate the characteristics of desirable shelters with the shelters' appearance at a distance. In a pilot study, two adult, wild-caught, *Octopus bimaculoides* were allowed over six trials to explore a Y-maze containing two types of shelters. The shelters were placed at the ends of the Y-Maze arms and their locations were randomized for each trial. We video recorded each trial and quantitatively scored the octopuses' movements through the maze. The octopuses did not show a systematic preference for a given shelter or maze arm. The animals' overall movement decreased precipitously after the first trial, $F_{(5,5)} = 5.11$, $p = 0.49$. This could be interpreted as learning of the environment and a concomitant decrease in exploratory behavior, or alternatively explained by fatigue. To achieve our aims, we are in the process of extending these pilot results into a full study of spatial learning in octopus.

PSY – 26 TRANSACTIVE MEMORY AND PERSPECTIVE-TAKING

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In the work field it is common that you may have to work in interdependent groups to complete a common goal that the organization shares. Interdependence is a relationship in which group members are mutually reliant on each other to perform a task. These kinds of relationships have been termed transactive memory (Wegner, 1995). Transactive memory systems originally described cognitive interdependence in couples and are now often used to examine cognitive interdependence in teams (Ren & Argote, 2011).

To develop a transactive memory system individual team members have to be able to successfully communicate with each other, which requires them to direct their cognitive focus away from self and onto another person. Perspective-taking is to place yourself in another person's shoes. This research will address the ties of perspective-taking and transactive memory. The question we want to answer is what effect does perspective-taking have on transactive memory? Based on prior research a person that was trained in perspective-taking is more likely to develop a better transactive memory system (Gockel & Brauner, 2013).

Forty six college students participated. Participants were given a survey at two different time points, measuring perspective-taking and transactive memory on a 6-point Likert scale (1 = strongly disagree; 6 = highly agree). Results show that people with low perspective-taking skills score lower on transactive memory than people with high perspective-taking skills. Over time, transactive memory does not improve for either group. This means that people with high perspective-taking skills will be better able in collaborations.

PSY – 27 POWER DISTANCE AND TRANSACTIVE MEMORY: CULTURE AFFECTS THE WORKPLACE

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Research on the effects of organizational variables that affect individuals has typically focused on group work rather than cultural variables. The purpose of this research was to demonstrate that power distance, a cultural dimension found in both individualistic and collectivistic cultures, is a phenomenon that impacts performance of both peers and superiors in an organization, potentially more than group level variables. Power distance was chosen from five cultural dimensions because workplace interactions between individuals of differing status take place all the time, making this aspect of culture particularly prevalent in organizations. Other variables used to measure and compare the impact of power distance on groups included transactive knowledge, trust, peer perceived performance, and interaction frequency. We expected that power distance would mediate the relationship between performance, trust, interaction frequency and transactive knowledge. Data were collected using surveys prepared on SurveyMonkey and posted on the Brooklyn College SONA system. Data were analyzed in SPSS. Preliminary results show that power distance has no correlation with any of the variables in the study. Other variables such as transactive knowledge and trust have so far been shown to be more highly correlated with each other as opposed to power distance. These seem to go against the idea that individual cultural differences play a greater role in the workplace and that group level constructs have a more central role in work performance. Nevertheless, results of this study can affect how we interact and collaborate with colleagues and superiors.

PSY – 28 EFFECTS OF STIMULUS ELEMENT SEPARATION ON CONTRAST SENSITIVITY IN RATS

Cindy Yin (UN) and Daniel Kurylo, Department of Psychology, Brooklyn College

In the visual system, a systematic relationship exists between the spatial position of stimulus elements and sites of activation on the cortex. Rats have eyes that are placed laterally on their heads that allows for a broad field of vision and higher monocular visual field. To compensate for this extensive visual field, rats have a lower degree of binocular vision and less visual overlap. In the visual pathway, retinal messages are relayed contralaterally. Stimulus projected onto the left retinal will travel to the right visual cortex and vice versa. As stimulus elements become spatially further apart, the less retinotopic neurons are activated, and the harder stimulus elements are perceived as a unified entity. To test this relationship, rats viewed Gabor patches and measurements were made of contrast sensitivity on a

computer screen. We expect to find rats performing at lower levels during trials with Gabor patches at higher proximity than Gabor patches at lower proximity from one another. With increased proximity distance perceptually, the visual cortex will have weaker cortical connections due to complementary neurons that are spatially separated and have less activation.

PSY – 29 NEURAL NETWORK SIMULATION OF BEHAVIORAL MODULATION IN *PLEUROBRANCHIA CALIFONICA:* APPETITIVE AND AVERSIVE ORIENETATION BEHAVIOR

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Pleurobranchaea is a marine mollusk that instinctively computes a cost-benefit analysis amongst its behavioral options. It constitutes a simple model for understanding central modulation of sensory-guided orientation behavior. Following the empirical studies of Gillette (2007) we hypothesized that the modulation of orientation behavior in Pleurobranchaea is based on a binary internal state variable. We designed and implemented a recurrent artificial neural network of 21 model neurons arranged in seven ganglia that reproduced the known neuro-anatomical structures involved in appetitive and aversive orientation behavior in pleurobranchaea. The model received sensory input through a simulated oral veil; this signal was carried to the cerebropleural ganglion (CG), cost-benefit analysis was computed by 'feeding neurons'; the analysis was modulated by a computed internal hunger state. The motor output was sent to the paired pedal ganglia that control the body wall nerves that allow the pleurobranchaea to move and turn. Our results are qualitatively consistent with the performance of a real pleurobranchaea. The network produces orienting and avoidance behaviors that are modulated by the hunger level. A low hunger level produced avoidance behavior and high hunger level produces orienting behavior toward the appetitive stimuli. In computer simulations with this network we demonstrated a qualitative correspondence between the empirical results of Gillette with real slugs and our simulation results. Given that our network was neuroanatomically inspired we may have captured at least part of this biological cost-benefit evaluation system. We will next undertake quantitative evaluation through implementation in a biomimetically scaled robot.

PSY – 30 DANCE MOVEMENT NOTATION SCORING AND STATISTICAL ANALYSIS OF SYNCHRONIZED KINEMATICS IN COURTING PAIRS OF ARGENTINIAN MONK PARAKEETS IN BROOKLYN, NEW YORK

Alfie Supan [1] (GRAD), Monique Powell [2] and Frank W. Grasso [1,3] [1] BioMimetic & Cognitive Robotics Lab, Brooklyn College, [2] Midwood High School, [3]Ecology, Evolution and Behavior Program, The Graduate Center, CUNY

Monk parakeets (*Myiopsitta monachus*) are a highly sociable parrot species. This makes them candidates for finding ritualized motor control patterns used for communication. Here

we report on our development of precise quantitative methods to detect those patterns. We applied these methods to monk parakeet courtship behaviors because such behaviors are typically ritualized in birds (Lerhman, 1965). Digital video of courtship behavior was acquired in the field during their mating seasons in the springs of 2013 and 2014. The kinematics involved in their courtship behavior was then scored using Eshkol Wachman (Dance) Movement Notation. EWMN scores the relative angles (two perpendicular components) of one body part to another at the joints as a time series with fixed intervals. Video recordings of pairs of monk parakeets were scored to produce synchronized EWMN series for each parakeet. The two orthogonal time series for each body part on one bird was temporally cross-correlated with its counterparts on the other bird. The cross-correlograms for each body part were then averaged and analyzed for evidence of similar whole-body motor programs being executed by both birds. Statistically significant correlations of the 2 df coordination of 10 body parts were found with a 2 second delay in one of our samples (r (126) =0.24 p<0.05). Surprisingly, the active body parts separately showed a correlation r (90) =0.98 p<0.05) with a 2-second delay. These results suggest that courtship in Monk Parakeets contain ritualized motor programs and that the methods applied can identify and quantify those motor programs for precise analysis.

SCAS – 1 PRE AND POST STIMULATION RESULTS OF VOCAL FOLD FUNCTION WITH DYSPHONIC PARTICIPANTS USING THE MULTIDIMENSIONAL VOICE PROGRAM

Dr. Natalie Schaeffer and **Erin Blatti** (GRAD), Department of Speech Communication Arts and Sciences, Brooklyn College-CUNY, Brooklyn, NY 11210

Objective: The purpose of this pilot study was to compare data on two acoustic parameters before and after stimulability training of participants with dysphonia (voice disorders). These acoustic parameters indicate the degree of vocal fold instability during the production of the vowel /a/. The authors wanted to determine if perceptual improvements in vocal quality, through stimulability training, could be corroborated by the acoustic data immediately after the training. **Method**: The investigators assessed 20 participants between the ages of 20 and 30 who were perceptually rated as dysphonic on a Likert scale. To obtain the acoustic values, the participants were instructed on the procedure to prolong the vowel /a/ on the Multidimensional Voice Program (MDVP). Subsequently, the participants were stimulated/trained to use proper coordination of respiration and phonation and pull in the abdominal muscles for support to obtain a vocal improvement. After stimulation, acoustic data were again obtained on the MDVP, and were compared before and after stimulability training. **Results**: Results of the MDVP data were the following: Prior to stimulability training, the MDVP revealed aberrant vocal parameters for all participants, corroborating the diagnostic team's informal vocal analysis and subjective ratings of severity. After stimulability training, the diagnostic team found that all participants showed perceptually improved voices as well as significance differences in the vocal parameters measured by the MDVP. **Conclusion and Implications**: The MDVP is a reliable measure of parameter change in terms of demonstrating improvement in vocal fold function.

BIO – 1 PREDICTIVE VENOMICS: USING HYBRID MODELING TO GAIN FUNCTIONAL INSIGHTS INTO A NOVEL, PREDICTED GTPASE FROM AN IMMUNE SUPPRESSIVE WASP

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The host range of the parasitoid wasp *Leptopilina heterotoma* (*Lh*) includes the model organism, *D. melanogaster*. The venom gland complex of *Lh* produces both venom and virus-like particles (VLPs), both of which are oviposited by female wasps. VLPs are membrane-bound, stellate particles that lyse the cells that would normally encapsulate and kill wasp eggs. Our lab has sequenced, and characterized a partial transcriptome of the *Lh* venom gland. Approximately one-quarter of the expressed sequences either lack known similarities or show similarity only to hypothetical proteins. Threading suggests that one family of novel venom sequences is similar to the chloroplast Toc proteins, immune-related GTPases (i.e., GIMAPs), and the GTPase domain of dynamin-related proteins. Our first model from this novel gene family was creating using a combined *de novo*/homology method. Our model contains an a/b GTPase core; however, the presence of an insert within this region sets this protein's structure apart. This model will be the basis with which we explore the structures of other venom proteins, predict protein-protein and protein-membrane interactions, and begin to uncover the functional complexities of other novel Hymenopteran sequences.

BIO – 2 RANDOM MUTAGENESIS VIA GLASS-BEADS HIGH-FREQUENCY TRANSFORMATION OF *CHLAMYDOMONAS REINHARDTII* FOR FUSION-DEFECTIVE MUTANTS

Arelis Joa Zhou (UN) and Charlene Forest, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY

Chlamydomonas reinhardtii is a single celled algal model organism used to understand fertilization. GCS1, a gene present in some plants and other protists, was found to be required for gamete fusion. We have evidence that at least one other gene is also necessary. To determine what other gene(s) are necessary for the fusion of gametes, fusion-defective mutants of *C. reinhardtii* must be generated. Once multiple fusion-defective mutants are created, we will be able to locate and study the full complement gene(s) involved in fusion of *C. reinhardtii*. To create fusion-deficient mutants by insertional mutagenesis, we are using the glass-beads high-frequency transformation method using the plasmid pSI103. The plasmid pSI103 contains a gene which confers resistance to paromomycin. This gene is expressed in *Chlamydomonas* cells due to an added HSP70A/RBCS2 promoter. Transformed clones, resulting from the transformation procedure were later subjected to streptomycin selection. This selection is used to kill all cells that are able to fuse and from a zygote. Once fusion-defective mutants are identified, SiteFinding PCR will be used to locate the insertion site and possibly locate the gene(s) responsible for fusion for further studies.

BIO – 3 COMPUTATIONAL ANALYSES OF NEK-FAMILY PROTEINS: MODELING, EVOLUTIONARY, AND MUTATIONAL STUDIES

Ruchama C. Steinberg (UN), Dawid Plaza, Keith Bernis, Joseph Kabariti, Nathan Morris, Leonid Shoshin, Anastasia Veresciac, Shaneen Singh, Dept of Biology, Brooklyn College

Involvement of protein kinases, such as NIMA-like Kinases (Neks), in the cell cycle is linked with numerous cancerous phenotypes due to their variability of function, structure, and various interactions. Because of the potential of these proteins as chemotherapeutic targets, it is critical to understand the structure-function relationships of these proteins to ascertain their role in cancer. We have generated theoretical three-dimensional models of the Nek-family kinase catalytic domains, and elucidated structural and functional components critical to enzyme function through comparison with established Nek-family protein subfamily groupings based on phylogeny. Mutations from the Catalogue Of Somatic Mutations In Cancer (COSMIC) for the Nek-family proteins were evaluated for cancer driver characteristics using the CHASM algorithm. It was found that mutations in the critical regions of the enzyme were most likely to possess "cancer driving" character. Although further evaluation and rigorous statistical treatment will be used to quantify these data, our initial results suggest that structural domains housing the majority of these driver mutations are optimal targets for chemotherapeutic agents used to combat various Nek-linked cancers.

BIO – 4 CELL TYPE SPECIFIC ROLE OF MYD88 IN ACUTE LUNG INJURY

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Acute Lung Injury (ALI) is a potentially life-threatening syndrome of acute respiratory failure that results in inflammation and pulmonary edema. It can lead to serious pulmonary dysfunction and various neurological problems. Macrophages and endothelial cells both play important roles in ALI inflammation. The expression of myeloid differentiation primary response gene (Myd88) also plays an important role during inflammation, by activating a transcriptional pathway for inflammatory cell recruitment. Short-term whole body Myd88 deficiency protects against acute lung inflammation (LPS, cigarette smoke), but in a chronic inflammation state of the lung, it accelerates emphysema. This suggests that there is a cell type and stimulus specific role of Myd88 in pulmonary inflammation and lung tissue destruction, but the cell-specific functions of Myd88 remain unknown.

Our hypothesis is that the absence of Myd88 will lead to the decrease of inflammatory cells and protein content during lung inflammation. To assess the role of Myd88 in both cell types, two types of mice were studied: mice with either Myd88-specific knockout (KO) macrophage cells or Myd88-specific knockout endothelial cells. Wild type mice were controls for each of the two KO conditions. Macrophage derived Myd88 is crucial for the initial neutrophil recruitment to the lung and the production of pro-inflammatory cytokine *in vivo*. The endothelial cell specific Myd88 KO mice display significantly less protein leakage. Supported by NIH-NIGMS RISE GM062981

BIO – 5 MAMMALIAN CELL EXPRESSION OF M2E-HA1 CONSERVED SEQUENCES OF H5N1 INFLUENZA VIRUS

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The development of universal vaccine has been increasingly essential due to the high mutation rates of viral influenzas. In this investigation, fusing conserved sequences of the influenza M2e and HA1 proteins to Fc plus Fd or Fc designed a vaccine subunit. The proteins were constructed, expressed, and purified by using mammalian 293T cell expression system. The expressed proteins were analyzed by using SDS-Page and Native-Page. According to the sequencing and sizes of the expressed proteins, the proteins were expressed properly and maintained their trimeric structure. After retaining proper expression, these proteins indicate their abilities used in vaccines. It can then be further used to produce vaccines once it is properly tested in animal and clinical trials.

BIO – 6 STRUCTURAL MODELING AND AMYLOID SEQUENCE PREDICTION OF E-CADHERIN

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E-cadherin is an epithelial calcium-dependent adhesion protein that functions in intercellular adhesion. E-cadherin is composed of an intracellular domain, a transmembrane domain, and five extracellular domains. The extracellular domain is interest in studying because it is mediates E-cadherin clustering which results in cell-cell interactions. Our hypothesis is that the extracellular domain contains amyloid-forming sequences which are necessary for tight clustering of E-cadherin molecules. In an effort to design amyloidgenic and anti-amyloidgenic peptides to detect amyloid formation and function, we identified the predicted amyloid sequences in human E-cadherin and mapped them on the 3D structure of the extracellular domain. The amino acid sequence of the extracellular domain was analyzed using several amyloid prediction programs (i.e. Tango and Waltz) to determine amyloid forming sequences. The top sequences were mutated *in silico* into aggregation negative sequences according to the same programs. Eight sequences across the five domains were found to be highly predictive of aggregation. In order to further analyze these sequences, a three-dimensional model of the five domains was constructed using secondary structure predictors, tertiary structure predictors, and verification programs. Our data show that the extracellular domain of E-cadherin has predicted amyloid sequences. Two of the eight sequences were selected and mapped onto the three-dimensional model. These two sequences along with two substitution mutations for each were selected to be synthesized and studied *in vitro*. Our future plans are to test the peptides for binding to cell surface E-cadherin and inhibition of intercellular adhesion.

BIO – 7 DETERMINING THE SPECIFICITY OF AN ALS5P AMYLOID PEPTIDE PROBE FOR CANDIDA ALBICANS

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Cell adhesion molecules in *Candida albicans* contain amyloid-forming sequences that play an elemental role in cell adhesion and fungal-host binding. Previous experiments have shown that the Als5p peptide, a small sequence of amino acids that contain the amyloid-forming sequence IVIVATT, is useful for the identification of *Candida* in the human body. However, owing to the fact that there has been a rise of emergent *Candida* species (mostly *C. glabrata)* that cause fungal infections, we decided to test the hypothesis that the Als5p peptide probe is effective in detecting only *Candida albicans*. One strain of *Candida albicans* (SC5314) and two strains of *Candida glabrata* (CBS138, BG14) were probed with a FITC-labeled Als5p peptide containing the amyloid-forming sequence and observed by microscopy. We observed peripheral staining of *Candida albicans*, as seen previously with the probe. The majority of C. glabrata cells did not stain positive with the probe. The few cells that were fluorescent took up the probe ubiquitously with no clear pattern. We also demonstrated that both *C. albicans* and *C. glabrata* do not exhibit auto fluorescence. We conclude that *C. glabrata* strains do not bind the probe specifically to the cell wall, as demonstrated by the complete uptake of the dye by *C. glabrata* as opposed to the expected peripheral staining in *C. albicans*. Our results demonstrate that the Als5p peptide probe can distinguish between *C. albicans* and *C. glabrata*. Demonstration of the probe's species specificity is a critical step in the development for use as a diagnostic. We plan to further test this hypothesis by probing other clinically relevant *Candida* species.

BIO – 8 GAMETOGENSIS AND PHENOTYPIC PLASTICITY IN THE GREEN ALGA SCENEDESMUS OBLIQUUS

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Scenedesmus obliquus is a green microalga of the class *Chlorophyceae* that is commonly found in freshwater bodies. Gametogenesis, as well as other forms of widespread phenotypic plasticity, has been observed in certain strains of *S. obliquus* under conditions of constant light, nitrogen starvation and low temperature. Cultures were incubated at 15 °C in medium lacking nitrogen under constant illumination for 30 to 36 hours. In an attempt to observe iso-gametes in three different strains of *Scenedesmus obliquus* microscopy was performed on cell cultures that have been under these conditions for 36 hours. Gametes in *S. obliquus* appear as unicellular bi- flagellated cells. A significant number of gametes was not observed while cells in various other states of the sexual cycle may have been present which suggests some gamete copulation. Along with other morphological changes, vegetative cells took on a branched, ropy appearance after time possibly due to agglutination. A possible reason for the lack of an abundance of gametes, as described in past literature, may have been that the ability to produce gametes has been reduced due to prolonged laboratory culture of the strains used in the experiment. The ability to induce

gamete production is important in terms of strain development for future research in the sexual cycle of *Scenedesmus obliquus*.

BIO – 9 MAPPING THE MEMORY SPACE OF THE CHAMBERED NAUTILUS
Eliza Knipscher (UN) and Jennifer Basil

Research has found that many invertebrates encode memory of spatial information via one memory channel, whereas vertebrates, such as mice, encode memory of spatial information using two parallel memory channels. We examine interference between route memory and beacon memory in the chambered nautilus. If nautiluses encode memory using one module, as is frequently seen in invertebrates, we expect the dominant source of spatial information during training (a beacon) to overshadow the subordinate source (route memory), causing worse performance when tested without the dominant source; however, if nautiluses encode memory using two parallel modules, we expect them to perform equally well on a test with no beacon whether or not they were trained using a beacon. Research is still in progress and will provide important insight into the memory capabilities of the chambered nautilus.

BIO – 10 CHARACTERIZATION OF 5' AND 3' CIS REGULATORY ELEMENTS CONTROLLING THE EXPRESSION OF THE MOSQUITO METAMORPHIC TRANSCRIPTION FACTOR HR3
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The development of environmentally friendly larvacides to help control the spread of mosquito borne diseases such as West Nile virus, Yellow fever, and malaria presents an effective way of controlling mosquito population. The development of such larvacides depends upon understanding and possibly, manipulating mosquito metamorphosis to prevent adult development, and the spread of disease. Metamorphosis in holometabolous insects such as mosquitoes is induced by an ecdysone dependent transcription factor cascade. In *A. aegypti* this cascade may begin with the transcription factor Hormone Receptor 3 (HR3, *AAEL009588*). We are studying the control of expression of HR3 by 5' and 3' cis regulatory elements. 5' Upstream regions of HR3 with purported cis-regulatory sequences were cloned and will be used in expression vector constructs to detect cis regulatory promoter and enhancer activity. The 3' UTR may have post-transcriptional regulatory roles including sites for miRNA regulation and binding of regulatory proteins that affect the stability of the mRNA, as well as signal sequences for poly-adenylation. In *A. aegypti*, the 3'UTR of *AAEL009588*, is of particular interest as there is a discordance between the annotated 3'UTR and that determined by RNASeq analysis. We have determined by end point PCR and sequencing that the 3'UTR is longer than the annotated sequence by sequentially extending into the 3'flanking sequence of the cDNA and observing PCR products.

BIO – 11 CONSEQUENCES OF INTRODUCTION OF EFFECTIVE MICROORGANISMS TO THE RHIZOSPHERE OF *SOLANUM LYCOPERSICUM* 'MICRO-TOM'

Allen Yevtukhov, **Fatima Jilani** (UN) and Theodore Muth, Department of Biology. Brooklyn College-CUNY, Brooklyn, NY 11210

Effective Microorganisms (EM-1) is a commercially available microbial inoculant containing molasses, yeasts, fungi, and bacteria. Claims made by EM distributors regarding its effects include: promotion of stable growing conditions, protection against stress-related problems such as overwatering, maintenance of plant health, and reduction of problems associated with soils drying out. The influence of EM-1 on tomato cultivar 'Micro-Tom' is currently being evaluated in the greenhouse at CUNY Brooklyn College. Two treatment groups (EM-1 followed by H_2O, and molasses followed by H_2O, respectively) and one control group (only H_2O) were prepared in order to determine whether the microorganisms in the EM-1 solution produced an effect that differed from a solution consisting solely of molasses and whether EM-1 produced an effect on plant growth at all. At 21 days post-germination, plant groups were treated with their respective inoculants. The following parameters were measured weekly or bi-monthly throughout growth, until maturity/fruiting at 75 days: plant height, number of leaves, number of fruits and fruit diameter. After the conclusion of the designated growth period, plants will be removed from their pots and measured for the following parameters: total fresh weight, total fresh weight of leaves, total root length/depth, total dry weight, fresh weight of fruits and dry weight of fruits. In analyzing the results that have been collected so far, EM-1 and molasses treatments appear notably more effective in increasing plant growth than solely H_2O but do not deviate significantly from one another. However, due to environmental conditions in the greenhouse during the growth period, a repeat experiment is necessary in order to verify these results and augment certain aspects of the protocol to provide more robust data.

BIO – 12 NUCLEOLIN PHOSPHORYLATION PROFILING UNDER NORMAL AND CELLULAR STRESS CONDITIONS

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Nucleolin (NCL) is an ubiquitous nucleolar phosphoprotein that integrates critical cellular processes, from cell growth (ribosome biogenesis) and cell proliferation to cell cycle arrest and cell death. Deregulation of these processes often lead to different pathological conditions including cancer and heightened levels of NCL are often found in a variety of tumors. NCL is highly phosphorylated by two major kinases: interphase casein kinase 2 (CK2) and mitotic cyclin-dependent kinase 1 (Cdk1). The role of NCL phosphorylation in regulating cell cycle remains largely unexplored.
In this study we analyze NCL phosphorylation by novel phosphate (phos) tag binding in phosphate affinity gel electrophoresis and subsequent western analyses. We are able to detect and quantify different phosphorylation states of NCL during interphase as well as in mitosis in human osteosarcoma cells. CK2 phosphorylated NCL (as in interphase) has multiple bands that migrate slower when bound to phos-tag as compared to hypo-

phosphorylated NCL mutant (6/S*A, where six consensus CK2 sites were modified from serine to alanine and hence defective in undergoing phosphorylation). In contrast, a single hyper-phosphorylated NCL band was predominant in mitotic arrested cells.

Furthermore, we elucidated NCL phosphorylation patterns under various cellular stresses e.g. DNA damage (UV, CPT) as well as inhibition by CK2-specific inhibitor CX4945. Our data provide for the first time informative NCL phosphorylation patterns during different cellular conditions. This profiling of NCL phosphoprotein is essential in understanding the role of NCL phosphorylation in various cellular processes as well as during cellular response to stress.

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BIO – 13 PHENOTYPIC CHARACTERIZATION OF DIMYCOSEROSATE ESTER-DEFICIENT MUTANTS OF *MYCOBACTERIUM MARINUM*

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The genus Mycobacterium includes several obligate and opportunistic human pathogens such as *Mycobacterium.tuberculosis* and *M.leprae.* These disease-causing mycobacteria possess a uniquely thick and asymmetric cell wall and outer membrane that reduce their susceptibility to antibiotics and contribute to a high degree of pathogenicity and persistence within the host. A class of complex lipids known as dimycocerosate esters (DIMs) are found in the outer membrane of many slow-growing, clinically relevant mycobacterium species. DIMs consist of two structurally related groups, phthiocerol dimycocerosates (PDIMs) and phenolic glycolipids (PGLs), which have both been implicated in virulence and evasion of the host immune system. Elucidation of the biosynthetic pathways of these compounds is crucial to understand their role in the biology of mycobacteria and potentially identify new drug target candidates. Here, we report several phenotypic consequences of PDIM and PGL deficiency in *M.marinum (Mm)*, a fish pathogen and close relative of *M. tuberculosis.* We show that the loss of DIMs increases the susceptibility of *Mm* to a wide range of antibiotics and alters its ability to form biofilms and accumulate congo red.

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BIO – 14 DIFFERENTIAL NUCLEOLIN PHOSPHORYLATION PATTERN BY CK2 DURING INTERPHASE

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Nucleolin (NCL) is a multi-functional phosphoprotein that is differentially phosphorylated at the N-terminus by two major kinases: interphase casein kinase 2 (CK2) and mitotic cyclin-dependent kinase 1 (CDK1). Phosphorylation of NCL has been shown to cause it to participate in angiogenesis, to stabilize mRNAs related to tumor formation and to allow for NCL's participation in the production of proteins involved in malignant cell survival. In contrast, inhibition of phosphorylation of NCL by CDK1 has been correlated with necrosis of

cancer cells. Earlier reports from our laboratory suggest that mutations on NCL at six consensus CK2 sites results in activation of p53-checkpoint and inhibition of cell proliferation in osteosarcoma cells.

In this study we explore the functionality of NCL phosphorylation by CK2. The purpose of this study is to enable differential phosphorylation pattern of NCL-WT when it is phosphorylated vs. hypophosphorylated (i.e. in the presence of CK2 inhibitor, CX).

We performed laboratory techniques such as cell culturing, immunoprecipitation, phos-tag electrophoresis, SDS-PAGE and western blotting in order to determine the phosphorylation status of NCL. We observe that phosphorylated NCL-WT bands (in the absence of CX) migrate slower than the hypophosphorylated NCL-WT bands (in the presence of CX). This is the first report to our knowledge that describes multiple bands of phosphorylated NCL during interphase. The information derived from the study can be further used to identify the phosphorylation pattern of various NCL mutants and to determine alterations in NCL phosphorylation in order to understand the role of NCL in tumor progression.

BIO – 15 GENERATING PHOSPH-MIMIC NUCLEOLIN CONSTRUCT

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Nucleolin (NCL) is a nucleolar phosphoprotein that functions in ribosome biogenesis, chromatin remodeling, transcription and cellular response to stress. Cyclin dependent kinase and casein kinase 2 are serine/threonine kinases that phosphorylate nucleolin at consensus serine residues at its acidic N-terminal region. Increased nucleolin phosphorylation by CK2 in exponentially dividing cells is known, however, nucleolin's role in regulating the cell cycle is not yet elucidated.

In this study we focus on NCL phosphorylation by the major interphase kinase CK2. Earlier in our laboratory a phosphorylation-deficient mutant was created where six serine consensus CK2 sites were converted to alanine. Earlier reports from our laboratory demonstrate that NCL hypo-phosphorylation leads to p53 checkpoint activation that ultimately results in inhibition of cell proliferation.

We now like to validate our findings with a phospho-mimic mutant construct of NCL to observe opposite effects compared to the hypo-phosphorylated mutant. We will therefore generate a hyper-phosphorylated mutant where, the CK2 serine phosphorylation sites are converted to glutamic acid, which mimic the effects of the negatively charged phosphate group. This mutant construct will serve as a positive control for nucleolin phosphorylation. A site-directed mutagenesis kit will be used to induce the mutations sequentially and transformed into DH5α-T1R competent E. coli cells. Here we show the plan and primer selection to create this construct.

BIO – 16 METAGENOMIC MAPPING OF THE MASS TRANSIT AUTHORITY SUBWAY SYSTEM

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With the advent of increasingly sophisticated means of sampling urban microbial communities, it has become paramount to maintain genetic libraries to study microbial populations and monitor genetic dynamics over time. A metagenomic approach was used to survey the NYC MTA subway system for bacteria obtained from swab collections spanning an increasing number of train lines over several months. Special attention was taken to note the conditions of the swab, including the fomite swabbed, the weather conditions of the day of and days prior to swabbing, and the level of pedestrian traffic. The 16s rRNA sequences of bacteria isolated from each collection were submitted for next generation sequencing with Roche 454 pyrosequencing. The data was compiled and compared on a station/collection time basis to determine similarities between stations and to analyze how changing environmental factors in the same station over time affected the microbial community. This research is a joint project of Weill Cornell Medical College's PathoMap, which similarly aims to map the microbiome of the subway system. The ramifications of this research would establish a means of detecting emerging pathogens in the urban community, facilitate other research endeavors with an established library of mass transit microorganisms, and overall address public health concerns related to community acquired pathogens.

[not participating] BIO – 17 SOIL MICROBIAL DIVERSITY IN URBAN ENVIRONMENTS: PRELIMINARY RESULTS FROM NEW YORK CITY SOILS

Alonso J. Córdoba (GRAD) and Theodore Muth, Department of Biology, Brooklyn College-CUNY, Zhongqi Cheng, Department of Earth and Environmental Sciences; Environmental Sciences Analytical Center (ESAC), Brooklyn College-CUNY, Richard Shaw and Michael A. Wilson, USDA–Natural Resources Conservation Service, Somerset, NJ

Characterizing and understanding changes in the composition of urban soils is becoming increasingly important as populations progressively concentrate in these areas. Urban soils are critical for urban agriculture, urban reforestation, and ecosystem restoration, and microbial communities are key players in their dynamics. They respond to alterations in physical and chemical processes as a result of natural and anthropogenic events. In this project, we are collecting coupled dynamic soil properties (DSP) and microbial community metagenomic data from 48 sites in New York City. We are determining bacterial and fungal diversity and relative species abundance, species changes over time, and correlation with environmental variables. Sampled sites include native and human-altered soils. Samples are taken from each soil horizon and total DNA is extracted. Metagenomic data are obtained by sequencing DNA samples with an Illumina MiSeq sequencer, targeting the 16S rRNA gene V4 variable region for bacteria and ITS for fungi. We present preliminary data of microbial communities in the Latourette and Inwood Hill Parks. We see a higher microbial diversity on superficial soil layers, with proteobacteria as the dominant component, and decreasing diversity as depth increases, with bacteroidetes becoming more dominant than other groups. Microbial diversity seems to be comparable across sampling sites on the surface,

but the pattern of variation with increased depth shows some variation. Our findings will allow us to make comparisons with data sets from other environments to determine if urban soils differ substantially from agricultural soils or soils minimally disturbed by human activity.

BIO – 18 DETERMINATION OF AGROBACTERIUM TUMEFACIENS T-DNA INTERGRATION TIMING.

Rosio Fernandez, Polina Ferd (UN) and Dr. Theodore Muth, Brooklyn College

Genetically modified (GM) plants are one of the largest contributors to agricultural economy. GM plants can have many benefits which include the enhancement of nutrients and development of vaccines and therapeutic drugs. The bacterium, *Agrobacterium tumefaciens*, is most widely used to introduce foreign DNA into the plant's genome. However exact details of the mechanism of insertion of Transfer DNA (T-DNA) from the plasmid are still unknown. In order to define the mechanism, a novel approach was used to determine the timing of T-DNA integration into the plant genome using adapter ligation-mediated PCR coupled with next generation DNA sequencing. This will provide a more sensitive means of determining if there are "hot" or "cold" spots in the genome for T-DNA integration. We will also examine the influence of DNA double-strand break repair on the kinetics and location of T-DNA integration. Looking at these factors, will provide more material on the mechanistic aspect of the integration, allowing for further manipulation of GM plants.

BIO – 19 INCREASED MRNA LEVELS OF APOPTOTIC GENES UPON PHOSPHORYLATION-DEFICIENT NUCLEOLIN EXPRESSION

Esther Akinwunmi (GRAD) and Anjana Saxena, Dept of Biology, Brooklyn, College

Nucleolin (NCL) is a ubiquitous multifunctional nucleolar phosphoprotein that is involved in the processes of ribosome biogenesis, regulation of cell proliferation, growth, gene expression and cellular response to stress. Improper regulation of these processes leads to the advent of diseases such as, cancer. When a cell experiences DNA damage or cellular stress it attempts to repair itself or undergo apoptosis via its p53 tumor suppressor pathway. In cancer cells where mutations in the p53 gene are common, heightened nucleolin expression is also evident. Both these event can disrupt the cellular programmed cell death (apoptosis).

Nucleolin regulate apoptosis pathway at multiple levels: Post-transcriptionally, NCL either increases or decreases the stability of several mRNAs in the p53 pathway by interacting with their AU rich elements (AREs) via its RBDs. NCL binding to p53-mRNA inhibits its translation while binding to BCL2-mRNA increases its stability leading to cell survival. Post-translationally it targets p53-antagonsit Hdm2 to inhibit p53-degradation, thus stabilizing p53 protein that can induce apoptosis. Therefore, in this study, we decided to further dissect the role of NCL phosphorylation in p53-signaling pathway and apoptosis. We assess p53-pathway specific PCR-array of 84 genes in our NCL inducible cells, WT and phosphorylation-deficient mutant (6/S*A, six serine CKII consensus sites converted to alanine) cell lines.

Our results outline an overall trend of increased gene expression of the 84 genes in our mutant cells versus our Wt cells. Specifically within our apoptosis genes, observed are increased mRNA levels in our hypo-phosphorylated nucleolin construct (6/S*A). This is the first step in understanding a profound effect of NCL phosphorylation-deficient mutant in altering gene expression in the p53-pathway. This information will be useful in identifying new targets that can be either directly (via RNA binding) or indirectly (through other proteins or gene expression) regulated by NCL phosphorylation.

BIO – 20 MOLECULAR ANALYSIS OF PARKINSON'S DISEASE IN *DROSOPHILA*

Abdul Rehman (UN), Saboor Shaheed, **Elizabeth Hobenson** (UN), Syed Munir, Saad Alghamdi and Qi He, Department of Biology, Brooklyn College, CUNY

The severe degeneration of dopaminergic neurons is a likely cause for the onset of Parkinson's disease in adults. It is observed that dopaminergic neural degeneration frequently occurs at locations where α-synuclein is released from Lewy bodies of Parkinson's disease patients. Reduced dopamine levels suggest that dopaminergic neurons are lost, resulting in gaps in the neuro-muscular circuitry. Presently, very little is known about neuronal interaction and degeneration related to the onset and progression of Parkinson's disease. The clinical data from human Parkinson's patients suggest several possible genes that may be involved in the onset as well as the progression of the disease. Our research utilizes the fruit flies Drosophila as a model to investigate 3 such genes for their functions. We examine behavioral defects as a result of motor neuron deterioration mimicking the phenotypes associated with human patients. Our goals include dissecting pathways involving the three genes and motor neuron defects in mutants of these genes, and identify other protein components that interact with them. We expect that results from our pursuit should yield new insights about the molecular mechanisms of the Parkinson's disease.

BIO – 21 DBRAINBOW: MULTICOLORED NEURAL CIRCUITRY ANALYSIS OF PARKINSON'S DISEASE (II)

Igor Kipnis (GRAD), Wesly Brouard, **Philip Polansky** (GRAD), Chonn Cadiz, Chris Roblodowski and Qi He, Department of Biology, Brooklyn College, CUNY

The severe degeneration of dopaminergic neurons is a likely cause for the onset of Parkinson's disease in adults. It is observed that dopaminergic neural degeneration frequently occurs at locations where α-synuclein is released from Lewy bodies of Parkinson's disease patients. Reduced dopamine levels suggest that dopaminergic neurons are lost, resulting in gaps in the neuro-muscular circuitry. Presently, very little is known about neuronal interaction and degeneration related to the onset and progression of Parkinson's disease. Our research utilizes the fruit flies Drosophila as a model to investigate neural circuit formation and neural degeneration. We have three phases in our approach: (1) Creating a new *Drosophila* Brainbow (DBrainbow or DBB) method that will enable us to identify different groups of neurons in the brain and to establish their lineages and developmental history. Coupled with another technique (TOLD) we have developed, we will be able to assess neural synaptic interactions in the brain that have the potential to reveal neurons involved in

the formation of neural circuits. (2) We will analyze candidate genes that cause Parkinson's in humans. In particular, we will characterize Vps35 in flies for its expression pattern and synaptic partners of Vps35 neurons. (3) We will conduct locomotor behavior investigations to analyze Vps35 mutant flies for their neural muscular defects and to examine the rescuing effects of human Vps35 gene in *Drosophila*.

BIO – 22 ESTROGEN REGULATION OF DOPAMINERGIC INNERVATION OF THE INNER EAR IN A VOCAL FISH

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The production and perception of sound is dynamic and an essential component of reproductive behavior in the plainfin midshipman fish, *Porichthys notatus*. Previous experiments showed that the inner ear of female midshipman can encode higher frequencies in the summer reproductive periods compared to the winter non-reproductive period and this change can be induced in non-reproductive females by increasing circulating estrogen over 3-4 weeks. As in other vertebrates, fish have a cholinergic hindbrain efferent nucleus (OE) that projects to the inner ear to modulate sensitivity of hair cells. More recently, our lab discovered a second auditory efferent system of dopaminergic projections from the diencephalic posterior tuberculum (TPp) to the inner ear. Since the region of the brain that includes TPp is known to express estrogen receptors and locally synthesize estrogen in the brain, we tested the hypothesis that estrogen will upregulate dopaminergic but not cholinergic innervation in the inner ear of female midshipman. Female midshipman captured in the winter non-reproductive season were ovariectomized, treated with 17β-estradiol or control implants and sacrificed after four weeks. Fiber terminals exhibiting tyrosine-hydroxylase immunoreactivity (TH-ir) and choline acetyltransferase immunoreactivity (ChAT-ir) in the saccule were quantified and compared between groups. Overall, our results show a difference in TH-ir innervation of the saccule in animals with elevated estrogen levels. These data suggest that estrogen regulation of dopamine in the ear may play an important role in modulating seasonal plasticity of peripheral auditory frequency sensitivity.

BIO – 23 SUB-CELLULAR NUCLEOLIN LOCALIZATION AS AN INDEX FOR COLON CANCER PROGNOSIS

Anna Kozlova [1,2,3] (UN), Allana Rodriguez [1], Mintoo Patel [4], and Anjana Saxena [1]
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Nucleolin is a major nucleolar protein that has an essential role in cell growth and proliferation besides other functions in gene expression and cellular response to stress. Nucleolin localization within the cell has been correlated with cancer prognosis in gastric[1]

and pancreatic cancer[2]. It was found that nucleolin localization in the nucleolus is linked with an increased survival rate, as opposed to localization in the cytoplasm, which is linked to a shorter survival rate and higher recurrence rate[1]. Our aim is to further support nucleolin localization as a prognostic factor in colon cancer. In parallel, we analyzed inducible NCL-expressing U2OS osteosarcoma cells for sub-cellular localization of either NCL-WT or NCL-phosphorylation-deficient mutant (6/S*A, six serine CKII consensus sites converted to alanine). Immunohistochemistry was performed using 4E2 anti-nucleolin (for tissue sections) and anti-FLAG (for inducible NCL) antibodies, diaminobenzidine as a chromogen, and in some cases an avidin-biotin complex (ABC) kit for enhanced detection.

In both tissues and cells, we observed nucleolin to be predominantly localized in the nuclear region. We also observed nucleoplasmic NCL localization in certain conditions. We are currently standardizing our techniques to reduce the background and able to detect clearly different sub-cellular staining for NCL in various tissue sections and different human cancer cell lines. This will aid in correlating nucleolin localization with cancer prognosis, in the future.

BIO – 24 EFFECT OF DAUNOMYCIN ON C. ALBICANS STRAINS WITH DELETIONS OF ALS ADHESINS

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The purpose of this experiment is to understand the role of Als adhesins in formation of biofilms in *C. albicans*. The Als adhesins are associated with the formation of biofilms, because these adhesins mediate the adherence and aggregation of cells. As an opportunistic pathogen, *C. albicans* uses biofilms to adhere to host tissue and to the surface of medical devices. By testing the efficacy of daunomycin on strains of *C. albicans* with deletions of the Als adhesins, we should be able to observe the specific effect of these adhesins on biofilm formation. Daunomycin was used because it interferes with protein aggregates. The strains of *C. albicans* used contain deletions for Als1, Als3, and both Als1 and Als3. We treated both planktonic cells and mature biofilms with daunomycin. By using an assay that measures metabolic activity, we were able to analyze the activity of biofilms and planktonic cells. Daunomycin inhibited the metabolic activity of all strains, both in the biofilms and the planktonic cells. Daunomycin had greatest effect in the strain with both Als1 and Als3 deletions. This strongly implies that knockout of both adhesins are significant to cell adherence and aggregation. Further study on the double mutant will help us understand the importance of these adhesins.

BIO – 25 ANALYSIS OF THE GUT MICROBIOME FROM MIDSHIPMAN FISH

Elizabeth A. Darsan (UN), Joseph Kabariti, Pranitha Prabhu (UN), David Zilberman, and Theodore Muth, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

Our research is focused on determining the gut microbial diversity of midshipman fish. We determined the gut bacterial composition for thirteen fish (females, type I males, and type II males) by analysis of 16S rRNA gene sequence. The midshipman fish have dimorphic males,

each with very specific reproductive behaviors. Typically, type 1 males exhibit vocalization mating patterns, while type II males do not. The differences in their behavior are in part due to the variations in the size of vocal organs. It is possible, however, that other factors also contribute directly, or indirectly through the regulation of hormonal levels, to these two behavioral types of midshipman males. The gut microbiota will be examined to see if differences in the community composition of these bacteria could have an effect on the differing behavior of type I and type II males.

Afterward, the profile of the gut bacteria from the midshipman fish will be compared to the sequenced gut microbiomes of other types of fish, in order to determine whether or not a common core gut microbiota exists for fish. Based on recent experiments, there seems to be a common phyla existing in the gut constituents of certain fish. Specifically, bacteria that are part of the *Fusobacteria* phylum are present in the microbiota of the catfish, largemouth bass, and bluegill. (Larsen *et al*. 2014).

BIO – 26 ANALYSIS OF *ARABIDOPSIS THALIANA* INSERTION KNOCKOUT MUTANTS WITH *AGROBACTERIUM TUMEFACIENS* TRANSFORMATION

Martin Czerwczak [1] (UN), Lauren Nurse [1] (UN), Vladislav Rabiner [1], Anna Petrovicheva [1&2], Theodore Muth [1]. Brooklyn College [1] and CUNY Graduate Center [2]

Agrobacterium tumefaciens is a causal agent of crown gall disease which causes tumors in plants. The infection process is controlled by the Ti-plasmid a section of which is the T-DNA that randomly integrates into the plant cell genome. Expression of T-DNA by the plant leads to tumor formation. *Arabidopsis thaliana* (Thale cress) is a plant research model for which the whole genome and an insertion mutant database is available. In this study *Arabidopsis* mutants are analyzed for resistance to the initial attachment of *Agrobacterium tumefaciens* to the plant and for tumor formation. These mutants may possess the resistant to *Agrobacterium* transformation (RAT) phenotype or the enhanced *Agrobacterium* transformation (EAT) phenotype. These mutants were selected by protein sequence analysis data available in, and ordered from, the TAIR database and then analyzed with microscopy and a tumor assay. Based on these two analysis methods we can identify plants that have these phenotypes. It is likely that plants that have reduced *Agrobacterium* attachment be resistant transformation and those that have higher attachment will have higher transformation.

BIO – 27 SEASONAL PLASTICITY OF CATECHOLAMINERGIC INNERVATION OF AUDITORY CIRCUITRY INA VOCAL FISH

Alena Chernenko [1] (UN), Dmitriy Milkis [1] (UN), Zachary N. Ghahramani [2], Camillia Monestime [1], Philip Kurochkin [1] and Paul M. Forlano [1,2,3]
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The plainfin midshipm an fish, *Porichthys notatus*, is an excellent model to explore mechanisms underlying seasonal plasticity in audition related to reproductive social behavior. While it is well established that steroid hormones such as estrogen drive seasonal

peripheral auditory plasticity in female *Porichthys* in order to better encode the male's mate call, little is known of the neural substrates that underlie the motivation and behavioral response to auditory social signals. Since catecholamines, including dopamine and noradrenaline, are thought to modulate the salience of and reinforce appropriate behavior to socially relevant stimuli, we tested the hypothesis that reproductive summer females show differential CA innervation of auditory nuclei compared to non-reproductive winter females. We utilized quantitative immunofluorescence to measure tyrosine hydroxylase immunoreactive (TH-ir) fiber density in auditory nuclei throughout the brain. In addition, we analyzed TH-ir terminals on somata and dendrites of the cholinergic hindbrain octavolateralis efferent nucleus (OE) by double-labeling with a choline acetyltransferase (ChAT) antibody, and quantified both TH-ir and ChAT-ir terminals on the sensory epithelium of the saccule of the inner ear. Reproductive females had significantly greater TH-ir innervation of the auditory thalamus, and greater density of TH-ir terminals on somata and dendrites of the OE which sends projections to the inner ear. In contrast, non-reproductive females had significantly greater TH-ir density in the saccule and in one hindbrain auditory nucleus. Seasonal changes in CA innervation of the peripheral and central auditory system may serve to modulate auditory sensitivity and behavioral response to social acoustic signals during the breeding season.

BIO – 28 THE EFFECTS OF GUANIDINE HYDROCHLORIDE ON THE FOLDING OF ALS5-PAL1

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Candida albicans is a pathogenic fungus whose uncontrolled growth causes diseases in both healthy and immunocompromised individuals (Hoyer et. al, 2001). Usually found in the human esophagus and urinary tract, *C. albicans* is the main cause of oral thrush in infants' mouths and vaginal candidiasis in healthy women. The agglutinin-like sequence (Als) family of glycoproteins found in *C. albicans* mediates cell-to-cell and cell-to-surface aggregation by forming amyloids. Each *ALS* gene shows similar characteristics that affect the formation of amyloids, but encodes large cell surface proteins differently. This study's objective is to examine the affect of Guanidine Hydrochloride (GuHCl) on the folding of the Als5-pAL1 soluble protein. GuHCl is a denaturant that may unfold the Als5-pAL1 and affect its ability to aggregate into protein amyloids. This Als5-pAL1 construct contains the full-length sequence without a GPI anchor. We first collected the concentrated Als5-pAL1 soluble protein by purification. Using the absorbance at A_{280}, we determined the most concentrated fraction and confirmed the presence of Als5-pAL1 by immunoblotting. This sample was then examined using CD spectroscopy, to investigate the presence of amyloids by the characteristic beta-sheet confirmation. We determined the total protein concentration of our sample by running a bicinchronic acid (BCA) assay, in which color change is measured by finding the absorbance. Based on the concentration, we incubated our sample with varying GuHCl concentrations and loaded them on an electrophoresis gel, comparing the mobility against standards in a ladder. From there, we can determine GuHCl's effectiveness in promoting or fragmenting aggregates of Als5-pAL1.

HNS – 1 THE EFFECT OF A HIGH-FAT DIET ON WHOLE-BODY INSULIN RESISTANCE

__Yasmine M. Brown-Williams__ (HS); Jessica Yip, Midwood High School, Department of Psychology, Brooklyn College-CUNY

Insulin resistance and the illnesses that accompany it are associated with obesity, a condition that can be produced by overconsumption of fat. High-fat intakes even in the absence of marked obesity can produce insulin resistance. However, the type of fatty acids that compose the diet appears to dictate whether insulin resistance will occur.

Insulin resistance is characterized by an inability of insulin to trigger its normal cellular responses. Whole body insulin resistance, which can be assessed by an insulin tolerance test, initially reflects insulin resistance in the muscle. We compared the ability of a high polyunsaturated diet versus a high saturated fat diet to produce whole-body insulin resistance in 45 male Sprague-Dawley rats in seven days.

In the insulin tolerance test, insulin (1 U Humulin R/kg of body weight) was injected into the peritoneal cavity and blood glucose concentration was measured at T_0 (time before injection) and at 15, 30, 45, and 60 minutes after injection. The decline in blood glucose level after injection is a measure of sensitivity to insulin.

None of the animals exhibited insulin resistance. Although the glucose versus time curves of the no-fat and saturated fat groups were parallel, the polyunsaturated group had a delayed response to the insulin injection. Our data suggest that a diet high in polyunsaturated fat may have an insulin desensitizing effect.

HNS – 2 TIMING OF SIGNAL TRANSDUCTION EVENTS OF THE INSULIN PATHWAY IN THE RAT LIVER

__Tali Lipper__ (GRAD), Susanna Slukhinsky, Marianna Harper, Kathleen Axen, Department of Health and Nutrition, Brooklyn College-CUNY, Brooklyn, NY 11210

The aim of the study was to investigate the 1) temporal changes in the activity of key enzymes in the insulin signaling pathway and 2) the effects these changes have on the abundance of target proteins (lipogenic and gluconeogenic). This information is necessary to identify the optimal time for liver sampling in later studies.

Male Long-Evans rats (n=8) were food-deprived for 24 hours and divided into the following groups: D (fasted), and two groups that received intraperitoneal insulin and glucose injections: early (E, sampling at 20 min post injection), and late (L, sampling at 35 min post injection). Phosphorylation of and abundance of proteins were detected by immunoblotting of proteins from liver lysates.

Phosphorylation of protein kinase Akt (Akt), p70S6 Kinase (p70S6K) and p70S6 (p70S6) is absent in the fasted state, it first appears at 20 minutes and increases at the 35 minute. The Phosphorylation of AMP-dependent Kinase (AMPK) starts declining at 35 minutes, while no changes in the phosphorylation state of Acetyl-CoA Carboxylase (ACC) can be detected at 20 or 35 minutes. In contrast, the total amounts of Akt, AMPK, ACC, p70S6K, p70S6, Fatty acid Synthase (FAS), and nuclear Sterol Response Element Binding Protein (SREBP) proteins remained unchanged at both time points after the same stimulus. This indicates that changes in the activity of insulin-regulated enzymes can be detected starting at 20 and

continuing at 35 minutes after insulin stimulation. This time window captures the key changes and is suitable in studies that focus on these pathways in liver.

HNS – 3 EFFECT OF HIGH POLYUNSATURATED VS HIGH SATURATED FAT DIET ON HEPATIC EXPRESSION OF GLUCKOKINASE AND MICROSOMAL TRIACYLGLYCEROL TRANSFER PROTEIN, AS INDICATORS OF INSULIN RESISTANCE.

Jo Ann Brown (GRAD), Tushara Edupghanti, Omar Batista, Marianna Harper and Kathleen Axen, Department of Health and Nutrition, Brooklyn College-CUNY, Brooklyn, NY

The ability of high fat diets to produce insulin resistance in the liver is dependent on their fatty acid composition. The short-term effect of a polyunsaturated fat (78% linoleic acid) diet was compared to that of a no-fat or a 99% saturated fat diet on expression of two insulin-regulated genes: glucokinase (GcK) and microsomal triacylglycerol transfer protein (Mttp) in rats.

Forty-five male Sprague-Dawley rats were divided into three diet groups: a "no-fat", a "saturated fat" and a "polyunsaturated fat" (both 55% of kcal as fat) diet for one week. All animals were food deprived for 24 hours and liver samples were collected from fasted animals, animals re-fed with no-fat diet for 24 hr, or 45 min after injection with insulin and glucose. Hepatic gene expression of GcK and Mttp was measured by real-time pcr amplification. Hepatic lipid concentration was measured using chloroform: methanol extraction.

Refeeding or insulin and glucose injection stimulated GcK expression in all diet groups, indicating a response to insulin. Expression of GcK was highest in animals on saturated and polyunsaturated diets. Insulin suppressed the expression of Mttp in the no-fat group, but the effect was blunted in both high-fat groups. This suggests the production of insulin resistance by the two high-fat diets. Both high-fat diets increased hepatic lipid level compared with the no-fat control group (P<0.002).

Our results indicate that short-term intake of these high-fat diets diet produces hepatic steatosis and impairs insulin's regulation of Mttp expression, which may indicate early stages of insulin resistance.

HNS – 4 TWO ARM BLOOD PRESSURE MEASUREMENTS IN ADOLESCENTS

Eli Mosser, Joseph Levy (HS) and Steven Kaye, Magen David Yeshivah

Recent articles suggest that variations in blood pressure from one arm to the other may be a reliable early indicator of future heart problems or early mortality. Differences of more than 15mm Hg in the systolic measurement have been found significant. A paper published in 2011 states that "a significant difference in all-cause mortality (occurred) from a difference in systolic blood pressure between arms of 10-15mm Hg." [Dr Christopher Clark, Peninsula Medical School, UK]. Clark's meta-analysis included hypertensive and non-hypertensive patients.

The literature studied only described variations in adult patients. A study was designed to

look at interarm blood pressure in High School students in a Brooklyn high school. To eliminate bias, measurements were taken using either the right or left arm as determined by the flip of a coin. Prior to taking the measurements the subject was asked to flip a coin with heads indicating right arm and tails indicating left. These measurements were taken using the radial artery and an electronic wrist cuff, eliminating the need to roll up sleeves and manually pump up the cuff. After data was collected it was analyzed statistically. All students tested showed some variation between arms however variations greater than 10 were relatively rare. Journal articles give several reasons why physicians do not generally take blood pressure in both arms. The authors claimed that many physicians are unaware of the significance of two arm measurements and others avoid the readings to save time. As more doctors become knowledgeable about the significance of two arm blood pressure readings they may become an important part of all physical exams.

HNS – 5 LINK BETWEEN SYSTEMIC COBALAMIN DEFICIENCY AND CNS DEMYELINATION IN TCblR/CD320 KO MOUSE MODEL

Allen T. Barbarovich (HS) Midwood High School

In humans, vitamin B12 (cobalamin, Cbl) deficiency has been clinically reported to cause severe neurological and neuromuscular disorders including demyelination of the nervous system. Transcobalamin receptor is the cell membrane protein responsible for cellular uptake of B12. A genetically engineered mouse model was created in order to investigate the B12 induced demyelination by ablating the expression of this protein. Biochemical analysis verified a resulting severe B12 deficiency in the central nervous system, but relatively normal systemic B12 levels. Place avoidance testing was done on the experimental groups to investigate any loss in learning and cognitive function due to the neurological B12 deficiency and no loss of cognitive ability was identified. Systemic B12 levels were further lowered with specialized diets and the animals were tested using the hanging wire test to test tensile strength and the pain threshhold test to test sensitivity to mild heat stimuli. Both tests yielded significant results that confirmed peripheral demyelination as a result of the intensified B12 deficiency.

HNS – 6 THE EFFECTS OF A NUTRITION EDUCATION PROGRAM ON NUTRITION KNOWLEDGE, ATTITUDES, AND BEHAVIORS AMONG ELEMENTARY SCHOOL CHILDREN IN NEW YORK CITY

Aranza Portugal Leon (UN), Brooklyn College, Dr. Kristin Mmari, Dr.PH, M.A., Dept of Population, Family, and Reproductive Health, Bloomberg School of Public Health

Cookshop Classroom is a nutrition education program offered to students in grades kindergarten through second grade in public elementary schools located in low-income areas of New York City. Through various activities students learn the importance of healthy eating, the affects of food on the body, and preparation of healthy meals.
An evaluation study was conducted by researchers from Johns Hopkins Bloomberg School of Public Health and the Harlem Health Promotion Center at Columbia University to determine the impact of a nutrition education program on the knowledge, attitudes, and behaviors

regarding healthy eating among low income elementary students and their families in New York City.

As part of the evaluation study, baseline data was collected in the spring of 2013 among 14 intervention schools and 2 control schools using surveys and cafeteria observations. Child surveys where administered at the schools on iPads, while parents were given a choice to take their surveys on iPads or using paper and pencil. Both child and parent surveys included questions on food and nutrition knowledge, food preference and dietary intake.

In total, 395 parents and 380 children completed the survey. The study showed high child preference for fruits and dairy products and low preference for plant-based protein products such as garbanzo beans, black beans, and hummus.

Analysis of the data is currently underway, and is expected to inform evaluators about the current state of nutrition knowledge and behaviors among young children. Follow up data will be used to detect further changes between intervention and control schools.

ENV – 1 A SIMPLE DESIGN TO HELP SOIL RETAIN WATER ON GREENROOFS

__Ashley Yip__ (HS), Zhongqi Cheng, Department of Earth and Environmental Sciences, Environmental Sciences Analytical Center, Brooklyn College - CUNY, Brooklyn, NY, 11210

It is desirable for soil on greenroofs and rooftop gardens to maintain moisture levels so that the plants can survive droughts, and to limit the need for frequent irrigation. This project is to test whether a simple design, where the bottom layer of the soil substrate is made impermeable to hold excess water, can help to maintain good moisture content for the both the rooflite soil and a regular natural soil. Two types of devices, moisture sensor and the gypsum block, both measuring soil moisture levels, were used and readings compared. The experimental group consisted of a pot of rooflite soil and a pot of normal soil with a petri dish placed at the bottom of the pot. The controlled group consists of the same two pots but without the petri dish. Water was poured into each pot until the soil was fully saturated and overflew, and moisture readings were recorded by either a logger at 20 minute-interval (for moisture sensor) or manually every day (gypsum block). The results show a contradiction between the gypsum block and the moisture sensor.

ENV – 2 A DETERMINATION OF SALT INTRUSION USING DAPHNIA MAGNA

__Nathan Hasbani__, __Tanya Kbabia__ (HS), Steven Kaye, Magen David Yeshivah High School

Hurricane Sandy was a recent event causing major changes in both the shoreline and fresh water ponds and streams along the coast. In addition to natural changes, the removal of fresh water from wells, lakes, and rivers for use by human beings also effects the volume of water in these reservoirs.

The intrusion of sea water into both wells and fresh water ponds and streams has been identified or known for many years and is becoming more serious as the use of fresh water is increasing. Fresh water depletion often causes salt water intrusion.

Daphnia magna has been recognized as a test animals for biological assay for many years. Many authors have recognized advantageous qualities about the Daphnia for water testing. In addition to their small size and rapid reproduction, their transparent bodies make it possible to observe their heartbeats and other physiological functions through a microscope.

A research plan was developed to formulate a protocol for determining the salinity of fresh water sources through the use of Daphnia magna as a test organism. Daphnia were ordered from Carolina Biological Supply Co. Test solutions were prepared ranging in salinity from zero to ten milligrams per liter. Daphnia were exposed to these solutions in microscope well plates and the heart rates were counted and averaged. A table was developed showing the relationship between salt concentration and Daphnia heart rates. To confirm the concentration of solute (salt) within the solutions, the water samples were also tested with a hydrometer as a control.

ENV – 3 UNDERSTANDING THE CLIMATIC AND HUMAN IMPACTS ON THE BALKAN LANDSCAPE DURING THE PAST MILLENNIUM

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The study explores the long-term dynamics among climate, landscape and humans in western Serbia, Central Balkans, utilizing pollen, charcoal and geochemical analyses of lake sediments. In 2012, the sediments were extracted from a sinkhole lake in Western Serbia (44°30'N-19°30'E) using a Livingstone piston corer. This 2.1 m long sediment core was sampled at 10-cm intervals and standardized chemical techniques were used to isolate the pollen, spores, and charcoal from the sediments. For each sample, the slides were mounted for microscopic identification and statistical analysis. X-ray Fluorescence (XRF) technique was employed for obtaining geochemical signals from the past landscape; the initial set of readings was taken using a handheld XRF machine at 5-cm intervals. AMS ^{14}C dates of the macrofossil remains from the core provide the chronology of ecological changes and human-environmental interactions during past 500 years. Results from this study demonstrate distinctive pollen assemblages from temperate indigenous trees (e.g. oak, pine) and herbaceous taxa (e.g. grass, goosefoot) along with key anthropogenic indicator species (e.g. walnut, cereals) from the Balkans. Through this research, the long-term changes in vegetation and landscape under the influence of distinctive climatic periods (e.g. the Little Ice Age, Medieval Warming Period) and intensified human interference (e.g. changing agricultural practices, deforestation) can be traced and linked for the Central Balkans. Comparing these results with past ecological records from surrounding regions will establish and enhance broader spatial and temporal correlations across the Balkans and throughout Europe.

ENV – 4 REMOVING LEAD AND ARSENIC FROM CONTAMINATED SOIL

Kharene Gittens (HS) and Remi Henry, Environmental Sciences Analytical Center, Brooklyn College-CUNY, Brooklyn, NY 11210

Soil samples were collected from an orchard and treated with additives in hopes of lowering the concentrations of heavy metals, specifically lead and arsenic, absorbed in the foods grown in contaminated soil. The samples became contaminated with heavy metals through the use of pesticides in the orchard which caused a spike in the levels of heavy metals found in the soil. The treatments added to the soil contained lime, espoma, bone meal, green sense, compost and rabbit hill which are commonly known to immobilize heavy metals. The contaminated samples were XRF'd(x ray fluorescent gun) to find the concentrations of heavy metals and run through the ICP-MS(Inductively Coupled Plasma Mass Spectrometry) machine to get even more accurate results on the concentration of heavy metals that can be absorbed in the foods grown in these soils. The data shows that the addition of lime created

less resistance against absorption. The use of rabbit hill, espoma, green sense, and compost and bone meal did lower the amounts of heavy metals absorbed in the foods.

ENV – 5 TRENDS ANALYSIS OF FRINGING MARSH LOSS AND GAIN IN NEW YORK CITY USING GIS

Stephanie C. Rodriguez (UN) and Rebecca Boger, Department of Earth and Environmental Sciences, Brooklyn College-CUNY, Brooklyn, NY 11210

Fringing salt marshes have been diminishing since early industrialization in New York City potentially due to a variety of factors - erosion, inundation from sea level rise, high nutrient loadings, shoreline armoring, dredge and fill activity, and invasive species. Brooklyn College students in collaboration with NYC Parks and Recreation have been calculating wetland loss in marshes from 1974 to 2012 with the use Geographic Information Systems (GIS). Spatial analysis has been completed through aerial photographic interpretation of 1974 and 2012 satellite imagery. This involved detailed georeferencing to ensure precise alignment of the aerial images taken at the different dates. The GIS methods are being standardized to ensure quality and replicable results. The work presented here compares the "Union method" and "Erase function method" for three marshes, Idlewild Park, Saw Mill Marsh, and Pugsley Marsh. These methods will be assessed on their efficiency and ease of use. Accurately calculating spatial trend loss of fringing salt marshes is important for future conservation and restoration efforts in New York City. Testing various methods in calculating spatial trends will help standardize the protocol for future wetland analysis within the NYC Parks boundaries as well as other fringing wetland in New York City metropolitan area. Results of the trends analysis for these three marshes show varying rates of loss. Further research is required to explain the causes and variances of loss and gain.

ENV – 6 FINDING OUT WHETHER A GERRITEN CREEK UPLIFT IS FROM THE ICE AGE

Elliot Shrem (HS) and Steven Kaye, Magen David Yeshivah

Along Garritsen Creek there is an exposed cliff of soil showing three layers of shells separated by sediments, and it contains oysters that are now extinct in Garritsen creek and Jamaica bay. In addition these layers are above present sea level. As similar shell layers in other part of the world suggest uplift. It has been hypothesized that these layers formed during the ice age, uplifted during the melting of the ice, and were exposed due to erosion.

To determine whether the soil layers are glacial in origin several experiments were preformed. 1) soil grains examined in a microscope- to observe whether angular or rounded and to show soil texture. 2) percent organic matter within crucible- to see whether a lot of the soil is organic or not. 3) the distribution of sizes- to show if the soil was in uniform or if they were all different in size.

The first test revealed angular particles, which means that they are glacial. The next test revealed that there was a low percent organic matter. The third test showed that the soil was mostly uniform.

These tests suggest that the soil deposited between the shell layers were possibly of glacial origin and were not landfill soil. The shell layers can not be dated without the use of electron spin residence (esr). The soil tests suggest these layers were naturally formed, and predate the land filling in much of this area.

ENV – 7 ACTUOPALEONTOLOGY: USING MODERN FRESHWATER BIVALVES TO REVEAL THE BURROWING BEHAVIOR OF THE EXTINCT *ARCHANODON CATSKILLENSIS* (DEVONIAN)

Knoll, Katja (GRAD), Earth and Environmental Sciences, Brooklyn College, John A. Chamberlain Jr, Department of Earth and Environmental Sciences, Brooklyn College, and Doctoral Programs in Earth and Environmental Sciences and Biology, CUNY Graduate Center, and Rebecca B. Chamberlain, Department of Biology, College of Staten Island

Little is known about the extinct, sporadically occurring and generally poorly *preserved Archanodon catskillensis*, the oldest known freshwater unionoid bivalve. The vertical burrows associated with *Archanodon*, often one meter in length, are thought to be escape burrows generated upon catastrophic burial. To illuminate the nature of *Archanodon* burrows, the escape burrowing capabilities (escape potential, burrowing rate, burrowing dynamics as a function of shell morphology, sediment grain size, and burial depth) of two contemporary *Archanodon* analogues are assessed: the two native freshwater unionoid bivalves *Elliptio complanata* and *Pyganodon cataracta. Pyganodon*'s escape burrowing behavior is of particular interest as this animal is the best morphological analogue currently available for *Archanodon* based on shell size, shell shape and hinge structure. For comparative purposes, the escape behavior of the invasive venerid *Corbicula fluminea* is assessed as well. Burial trials reveal that *Archanodon*'s analogues are poor escape burrowers relative to *Corbicula*. The probability of a successful escape in fine sand is more likely than in coarse sand for all three species, while escape rates in coarse sand are lower. *Pyganodon* rarely escapes a burial depth of more than 10 cm. Thus the upward burrowing capabilities of these animals, particularly *Pyganodon*, demonstrate that *Archanodon*'s burrows are likely a result of episodic sedimentation rather than a single catastrophic sedimentation event.

ENV – 8 A NOVEL APPROACH FOR DETERMINING EARTHQUAKE LOSS USING A NEW MATHEMATIC MODEL

Daniel He (HS), James Madison High School

Earthquakes are among the world the most destructive disasters. The East Japan earthquake in March 2011, with Magnitude 9.0, caused more than 15 000 people to die. Rapid determination of property destruction and casualties are important for government and rescue agencies in order to provide a rapid and adequate response to provide emergency aid.

Several authors investigated earthquake destruction and methods for estimating the earthquake property losses. In addition, the HAZUS model has been used to estimate the total damage. All of these focus on property damage but fail to provide estimates of the casualty losses and the economic losses resulting from them.

An algorithm was developed based on previous models to provide a rapid estimation of casualties, and the economic losses resulting from them based upon earthquake magnitude, the size of damaged area, the population density in that area, and the level of development. The mathematic model was tested by using published historical data from National Oceanographic and Atmospheric Administration (NOAA) . The model was run for multiple trials and the results fall within the previously calculated range of casualties and economic losses, with several results very close to the data developed from long term studies after the initial response. This demonstrates that the variables used for this model are appropriate for a rapid estimation of the casualties and economic losses resulting from them.

ENV – 9 CAN EFFECTIVE MICROORGANISMS (EM) SUPPRESS PATHOGENS IN WASTE-WATER?

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The main focus of this experiment is to observe whether or not Effective microorganisms (EM) can effectively suppress pathogens in wastewater. Three buckets of pond water was used for this experiment, with two of them treated with an EM activated bran and activated liquid EM, respectively. Fecal and total coliform counts were checked for the pond water and for water samples from each bucket at 4 hours, 1 day, 3 days, and 1 week period after treatment started. Coliform counts in untreated pond water decreased gradually and almost disappeared after one week. This could be due to the exhaust of food for micro-organisms in water over time. Pond water treated with EM activated bran showed a faster and significant decrease in total coliforms, and there was no sign of coliform presence in each plate after the 1st day. However, pond water treated with EM activated liquid had an increase in coliform counts shortly after the treatment started, probably due to the excess nutrient in the EM material. Coliform counts then decreased as time went by, also suggesting the exhaust of food for micro-organisms. The results showed that EM activated medium could be useful for reducing pathogen in water, but the type of medium can have different effectiveness.

ENV – 10 WILL SALT ACCUNULATE IN BIOSWALE SOIL?

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Many bioswales are being developed in New York City to control storm water. One potential problem that could occur in the soil of these bioswales is the accumulation of salt in soil resulted from winter road salt. Many plants have limited tolerance to high salt content in soils. This experiment was conducted to examine how fast salt can be flushed by freshwater, and whether or not gypsum can help move the salt downward at higher rates. I hypothesized that soil salt levels would decrease gradually with more freshwater being passed through the soil, and that gypsum would help speed up such a process. For the first experiment, salt was added to the topsoil in a 5–gallon bucket followed by repeated addition

of tap water. The effluent was collected and volume recorded for every twenty minutes. The salinity of the collected effluent was then measured. For the second experiment, the process was repeated with the exception that gypsum was also added to the soil at the beginning. For both experiments, the salt level in the effluent dropped rapidly to less than 100 ppm after adding 5–6 pore volumes of freshwater. The experiment with gypsum appeared to show slightly faster decrease of salt levels. My results suggested that salt in soil can be leached out by spring runoff relatively quickly, thus unlikely it will pose risk to the health of plants. The addition of gypsum is not necessary since it only slightly improved the downward movement of salt through the soil.

ENV – 11 FERMENTED FOOD WASTE AND PLANT GROWTH: A GREENHOUSE STUDY

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Effective Microorganisms (EM) are reported to improve soil structure and expedite the release of nutrients from the food waste. The purpose of this experiment is to observe if EM-1 (a commercially available EM product) fermented food waste (FFW) can enhance the growth of Siberian Kale and Pot of Gold Chard. Soil amended with EM-1 FFW or regularly FFW was compared to un-amended soil, as well as an artificial soil mix (the Gaia Soil) for plant growth. Soil salt content and pH, as well as the plant weight and height, were measured during and after the experiment. For soils amended with either EM-1 FFW or FFW, all the kales with the exception of one died while some chards survived. Therefore, contrary to the literature, FFW did not enhance the growth of either type of plant, and regular soil or Gaia Soil was better for the plant growth. This may be explained by the high salt content and low pH of the soils from FFW amendments. It was also observed that plants grown in the regular soil had greener leaf than those grown in Gaia Soil – an indication of N-deficiency in the latter.

PHYSICS – 1 A STUDY OF THE TRANSPORT PROPERTIES OF THE ELECTROLYTES OF THE VANADIUM REDOX FLOW BATTERY

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The studies of transport properties such as ionic conductivity, viscosity and NMR Spectroscopy have provided valuable information in the improvement of electrochemical devices. Ionic conductivity is the measurement of a material's charge transport ability under the influence of an externally applied electric field and it is inversely related to the viscosity of a solution through the Strokes-Einstein Equation. NMR spectroscopy provides invaluable information of the mobility as well as structural information of the ions. Vanadium Redox Flow Batteries (VRFBs) are a promising stationary energy storage system capable of storing energy in multi-megawatt ranges and for long durations. The electrolyte material - vanadium solutions - of a VRFB is one of the most important components of the flow battery; acting as a conductor of the ions and as the energy storage medium. Understanding the transport properties of the vanadium solutions will provide an adequate description of interactions between species of electrolytes and provide clues to optimize the overall performances of VRFBs. It was observed that ionic conductivity tended to increase with increasing temperatures and that higher vanadium concentration led to lower solution ionic conductivity. The NMR studies have shown that there are fast exchanges between the various proton species and an increase in de-shielding. The objective of this research was to determine fundamentally the effects of the vanadium ions on the Vanadium Redox Flow Batteries.

PHYSICS – 2 HIGH PRESSURE NMR INVESTIGATION OF 3M FUEL CELL IONOMERS

David Cuffari (GRAD), Brooklyn College, Kartik Pilar, Hunter College, Jaime Farrington, Armando Rua, Eugene Ostrovskiy, Sophia N. Suarez, Phil Stallworth and Steve Greenbaum, Graduate Center, CUNY

The study of mass transport through a polymer electrolyte membrane (PEM) is of interest for improving fuel cell efficiency. Measurement of spin-lattice relaxation, T1 provides information about molecular rotational motion of water in the PEM. Self-diffusion measurements provide information about translational motion of protons through the PEM. PEM samples with equivalent weights (EW) of 700, 825, and 1000 were investigated. The samples were prepared with 10% and 20% water weight (wt. %). For increased sensitivity to rotational motion T1 measurements were performed using deuteron NMR. Static gradient self-diffusion measurements of the samples are made using proton NMR in the fringe field of a 7.3 Tesla magnet. Samples were run under varying pressure and temperature in a Cu-Br pressure chamber using Fluorinert as a pressurizing medium. Once the T1 and self-diffusion measurements have been performed the activation volume, ΔV can be calculated. T1 values were found to increase with rising temperature and decrease with rising pressure. The samples followed this trend for all three EW with both 10 and 20 wt. %. The values were also

observed to increase with EW. ΔV for T1 was calculated for all samples at various temperatures showing an inverse relationship to temperature and wt. %. Self-diffusion measurements have yet to be obtained and will be performed under the same variable pressure and temperature conditions. Once complete, ΔV for diffusion can be calculated. These results will allow for comparison of T1 and self-diffusion measurements of the samples; possibly providing insight into mass transport through a PEM.

PHYSICS – 3 THE EFFECT OF ELECTRODE SIZE AND COMPOST TYPE ON OUTPUT VOLTAGE OF 'MUD BATTERIES.'

Sammi Chung[1] (HS), Jasmin Kim[1], David Cuffari[2] and Sophia Suarez[2]
[1]Midwood High School, [2]Department of Physics, Brooklyn College

Modernization has allowed electricity to be abundant through the burning of fossil fuels that create pollution and harm in the long term. "Mud batteries", or more specifically, microbial fuel cells, are new developing batteries created for inexpensive and earth friendly purposes, by simply using bacteria and microorganisms from compost or sand in the battery, and eventually turning it into electrical energy. Electrical energy can vary depending on the electrode size and compost. In this project, variation of electrode size and different compost were tested to determine the highest voltage by using aluminum mesh as the electrodes (anode and cathode) on both ends of the compost in a container. In order to increase the electrical output, sand was added on top of the compost. Four different sizes of electrodes with the diameter of 3.4 cm, 5 cm, 6.8 cm, and 8.2 cm were used in this experiment. The 6.8 cm electrode was shown to be the ideal size for the mud battery.

PHYSICS – 4 ELEVATED TEMPERATURE DEPENDENT TRANSPORT PROPERTIES OF PHOSPHORUS AND ARSENIC DOPED ZINC OXIDE THIN FILMS

Bo Cai (GRAD) and Mim L. Nakarmi, Department of Physics, Brooklyn College-CUNY, T. N. Oder, M. McMaster, N. Velpukonda and A. Smith, Department of Physics and Astronomy, Youngstown State University, Youngstown

Elevated temperature dependent Hall effect measurements were performed in a wide temperature range from 80 to 800K to study transport properties of zinc oxide (ZnO) thin films heavily doped with phosphorus (P) and arsenic (As), and grown on sapphire substrates by RF magnetron sputtering. Double thermal activation processes in both P- and As-doped ZnO thin films with small activation energy of ~0.04eV and large activation energy of ~0.8eV were observed from variable temperature Hall effect measurements. The samples exhibited n-type conductivities throughout the temperature range. Based on photoluminescence measurements at 11K and theoretical results, the large activation energy observed in the temperature dependent Hall effect measurement has been assigned to a deep donor level, which could be related to oxygen vacancy in the doped ZnO thin films.

PHYSICS – 5 ENCODING INFORMATION WITH LIGHT'S ANGULAR MOMENTUM

Chris Ayala (HS), Midwood High School, Institute of Ultrafast Spectroscopy and Lasers, City College-CUNY, New York, NY 10031

We study the application of light's spin angular momentum (SAM) and orbital angular momentum (OAM) in data transmission and demonstrate that we can encode information in light's angular momentum. We apply Jones matrices to understand SAM and OAM and to describe the interactions of the SAM with the Q-plate, a dielectric birefringent plate capable of inducing an in-homogeneous phase shift on an incoming light beam, to create OAM states. With a standard 633 nanometer Helium-Neon laser, we study the propagation of a beam through a Q-plate and the propagation of OAM states through free space by breaking the symmetry of the beam and concentrating the beam to its focus. The OAM states created with the Q-plate reveal themselves as vertical bands separated spatially. We characterized the Q-plate to generate different OAM states, studied the dependency of OAM states on input polarization by changing the quarter wave plate orientation and evaluated the crosstalk, or the channel overlap when we sent in"pure" modes through the OAM Sorter. Through image analysis in MATLAB and qualitative analysis with the Jones matrices model of Q-plates, we found that the intensities of the OAM states vary in inverse proportion to that of the Gaussian beam. As we theorized, the intensity amplitudes of the OAM states followed Malus's Law and the OAM states created with the Q-plate were preserved and separate. We demonstrated that it is possible to preserve information within a beam of angular momentum.

CIS – 1 A FOCUS ON EFFICACY OF INTEREST-BASED LEARNING

Peter Cheung (UN), Department of Computer Science, Brooklyn College-CUNY

This study aims to provide a look at the efficacy of interest-based learning, which is defined in this study as the presentation of educational topics in the context of students' personal interests. In order to assess the impact of interest-based learning, we conducted a two-part survey on the Brooklyn College undergraduate population. The first part of the survey asked the student to select his/her interests from a listing of predefined interests. We then administered the second survey to the student, which contained a short lesson and a problem question presented in the context of the student's selected interests from the first survey. In addition, we presented an alternative version of the second survey, which *did not* present the educational topic in the context of any of the students' selected interests. The students' performance was measured by their ability to answer the problem question correctly and the time it takes for them to finish the second survey, both of which are defined in this study as key indicators of the impact of interest-based learning. We also gathered qualitative data from the students at the end of the second survey in order to assess their level of interest and confidence in the educational topic. Once we have compiled all the data from the surveys, we will attempt to show that students exposed to interest-based learning will have better performance indicators and higher levels of confidence in the educational subject than the students not exposed to interest-based learning.

CIS – 2 PROCURING SHAPEFILES FROM THE WEB IN OPEN SOURCE GIS

Derek Sanz [1] (UN), Dayton Clark [1], and Rebecca Boger [2]
Brooklyn College, [1]Dept of Computer Science, [2]Dept of Earth and Environmental Sciences

Obtaining data from the web for the purposes of storing, manipulating, and analyzing via open source Geographic Information Systems (GIS) proves beneficial to its users. Quantum GIS (QGIS) makes the libraries easily usable in plugins and applications. It provides a welcoming integration with Python, a scripting language to customize or automate GIS functions. This poster presents the QGIS plugin, *Procure,* implemented in Python. The plugin allows users to get shapefiles from the web to quickly download and upload into QGIS. Based on user input and Internet connection availability, the desired shapefile gets downloaded from the web and saved on the user's machine. ESRI shapefiles are the standard for vector data formatting in GIS software for representing geographic data. The vector layer in that downloaded shapefile gets uploaded onto QGIS with an attribute table ready for further processing. Procure uses the approach of manual examination using copy-and-paste when extracting information from websites. The information gathered as result of the plugin is transformed to structured data that is ready to get analyzed when using QGIS.

CIS – 3 POPULATION CHECK – QUANTUM GIS DESKTOP PLUGIN

Haiqiang Zou [1], ZhiHua Yang [1] (UN), Dayton Clark [2] and Rebecca Boger [3],
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Geographic Information System (GIS) is a computer system designed to capture, store, manipulate, analyze, manage and visualize diverse types of geographical data. It is widely used throughout the world to identify and address environmental problems, analyze relative spatial relationships of geographic features, and devise practical strategies for monitoring and managing such as improving transportation efficiency, and mitigating environmental damage.

Our project was designed to allow people a more efficient and easy way to analyze population information within their location. For inexperienced users, acquiring data from Quantum GIS (QGIS, an open source GIS program) can be complicated. Currently, users have to execute SQL queries in order to acquire such data. Our interface provides the user the options to choose different landmarks within the cities with an input box for users to type in a distance. The plugin then analyzes the distance that the user provides and displays the total amount of population within the distance. This plugin is written using an object oriented programming language called Python and the interface is designed using QT Designer.

This plugin can greatly benefit those who want to open a business in their location by providing them accurate population information. With accurate population information, business owners will be able to roughly estimate the flow rate of people and perhaps the type of business they should open.

CIS – 4 DEVELOPMENT OF WEB APPLICATION FOR EDITING SHAPEFILES BASED ON OPEN SOURCE SOFTWARE TOOLS

Natallia Charkasava [1] (UN), Dayton Clark [1], and Rebecca Boger [2], [1]Department of Computer and Information Science and [2]Earth and Environmental Science, Brooklyn College

The goal of this project is to build a web application for editing shapefiles, a popular geospatial vector data format for geographic information system (GIS) software. Open source software tools were used: PostGIS as database management system, GeoDjango as a web application framework, Python and JavaScript as programming languages, and HTML as a markup language. The purpose of the project is to provide geospatial web-based tools that enable users to display and edit geospatial data stored in shapefiles. *ShapeEditor* application allows users to perform all basic operations on shapefiles: import and export shapefiles, view, add, delete, and edit shapefile's features and their attribute values. It is user-friendly and requires little knowledge of GIS. It is hoped that after final debugging and deployment this application will help people quickly solve minor shapefiles editing challenges without spending money and time on commercial software and installation.

CIS – 5 IMPLEMENTING A PLUGIN, *EASYVIEW*, TO OPTIMIZE THE USE OF QGIS SOFTWARE

Muhammad Syed [1] (UN), Dayton Clark [1], and Rebecca Boger [2], [1]Department of Computer Science and [2]Department of Earth and Environmental Sciences, Brooklyn College

Though we may not know it, much of the technology we purchase is built upon open-source software and programming languages. It is of utmost importance to take advantage of such readily available resources and implement new methods to further our technological advances in all fields. Here, the programming language Python and the application QtDesigner were used in order to create a plugin for QGIS, an open-source GIS application, which allows a user to analyze and manipulate geographic data. *EasyView*, the mentioned plugin, is used to create a smoother, quicker interface in the QGIS software. Doing so is important not only because it is more efficient, but also because it improves usability of the software in lower end computers. Improving QGIS is beneficial not only to QGIS, but to other GIS applications, which are used in various settings. This plugin may seem simple at first; however, it has the potential to branch into many different projects and implementations.

CIS – 6 THE SOFTWARE DEVELOPMENT PROCESS EMPLOYS STANDARD ENGINEERING PRACTICES IN ORDER TO FACILITATE THE COMPLETION OF LARGE PROJECTS

Murray A Gross and **Matthew S Conroy** (UN), CIS Dept, Brooklyn College-CUNY

The goal of this project is to demonstrate the essential practices of the software engineering process using an example program written in Java. The program, named Whack-A-Prof, is a videogame that follows a classic whack-a-mole arcade design formula. Players are given a set amount of time to smash as many professors and deans as possible. The project illustrates the various phases of the software development cycle from analysis and design all

the way through implementation, testing, and deployment. It focuses on software development as an engineering process and looks at the social organization necessary to facilitate successful execution. The presentation captures how groups interact using standardized development practices, documentation, and special tools in order to successfully see a software engineering project to completion.

CIS – 7 DEVELOPMENT OF A WEB APPLICATION THAT IMPROVES ACCESS TO NEW YORK SATE LANDMARK INFORMATION USING *DJANOG LEAFLET AND DJANGO GEOJSON*

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In many web mapping tools such as Google Maps you can easily traverse from one location to another if you know the addresses or can make educated guesses of these locations or waypoints. This project created a website and a web application that enable the user to display a shapefile of New York State landmarks along with other geographic data using LeafLet and Geojson layering. The shapefile format is commonly used in Geographic Information Systems (GIS). The web appplication allows the user to view all the possible landmark locations without making the user enter or manipulate the data, and allows the user to click over the landmark to show its information. Several utilities were used during this development in addition to Leaflet and Geojson. An open source programming language called Python was used along with GeoDjango, a web framework written in Python. GeoDjango takes shapefile information for editing and displaying. A database postgreSQL in conjunction with PostGIS was used for storing shapefile information. With the completion of this pilot project, this web application will be made available to use on smart phones.

CIS – 8 PARALLELIZATION OF PAIRWISE RMSD COMPUTATIONS FOR PROTEIN STRUCTURE CLUSTERING

Pr. Gabriel Yarmish and **Simon Dexter** (GRAD), Dept of Computer Science, Brooklyn College-CUNY, Brooklyn, NY

Protein structure prediction is an important problem in bioinformatics community. One approach to this challenge entails generating multiple candidate molecules for a given amino acid sequence and identifying best structures. To this end, pairwise comparison of candidate structures using suitable similarity metric (e.g. RMSD) can provide data for clustering which can then be used to construct meaningful groups of structures and facilitate their analysis. The construction of a pairwise similarity matrix is a computationally intensive task which can benefit from parallelization on multiple core machines and across multiple nodes. We implemented sequential Kabsch algorithm for standard RMSD computation and distributed computation of pairwise similarity matrix using MPI. In addition, we also implemented iRMSD (intra-RMSD) algorithm which does not involve molecular rotation. Our results show predictable speedup as the count of processors increases with expected deterioration due to growing communication costs. In the next phase, we plan to parallelize single-linkage

hierarchical clustering algorithm and construct a dendrogram on clusters of candidate structures which should further facilitate their analysis.

ENG – 1 CAN THE COMPRESSION AND FLEXION OF RECYCLED AGGREGATE CONCRETE BE IMPROVED?

Mateen Yousaf (HS), Steven Kaye, James Madison High School

This research investigates the mechanical properties of concrete made with recycled concrete aggregate (RCA). As most conducted research shows, the incorporation of recycled concrete aggregate reduces the compressive and flexural strength of concrete. This research seeks to enhance the strength of concrete made with recycled without increasing cement content by keeping in mind the standard specifications for concrete aggregates. In the United States the amount of construction and demolition waste is over 300 millions tons per year. Another One of the primary motivations of this research behind making recycled concrete aggregate is to increase environmental sustainability. The production of concrete hives off a large of CO2, which is not a suitable option for increasing the strength of recycled concrete aggregate. This research also tests the effects of nano-silica, a byproduct of industrial processes, and silica fume.

ENG – 2 AUTONOMOUS ROBOT NAVIGATION THROUGH A MAZE

Ely Esses (HS), Steven Kaye, Magen David Yeshivah High School

The question being investigated is whether it is possible for a robot to autonomously navigate through a maze using ultra-sonic sensors.

This research was performed using a Parallax Boe-Bot classroom robot, PING ultra-sonic sensors, a parallax bs2 microprocessor, the P-Basic programming language, and plastic blocks assembled into a maze.

There is a pre-existing program that drives the robot. We modified it so that it will allow the robot to move close to walls and identify narrow passageways and travel through them.

In this project the robot will be able to make autonomous decisions concerning the directions of travel. The program will direct the robot to scan its surroundings and find its own way. Multiple trials were conducted for reliability. To improve the performance the program was modified. An autonomous robot can be used for many things. If a power plant explodes, as occurred in Japan, it might be too dangerous for people to enter. A robot is not affected by the radiation and if you strap a camera to its back it can take pictures and send them back for examination. The conclusion of the trials is that the Boe-Bot can sense the presence of walls, turn away, and self-navigate itself out of a maze.

ENG – 3 A DETERMINATION OF PLATFORM DESIGN FOR FIXED WHEEL ROVING VEHICLES

Evan Mosseri (HS), Jason Azayev, Steven Kaye, Robotics Club, James Madison High School

The FIRST FTC competition sets stringent requirements for the platform design of competing robots. In addition, the playing field in which the robots operate provide limited traction as well as steep slopes. A robot was designed and constructed for the 2013-2014 FIRST FTC

competition. Experimentation was performed and design alternatives were analyzed in the planning and construction of the completed vehicle.

The robot platform was constructed using 29 cm long TETRIX aluminum beams and both angled and straight aluminum bars. The platform and superstructure were designed in order to minimize weight while providing maximum clearance and traction. The initial design utilized two 12 volt DC motors mounted at the vehicle's center and additional free-spinning wheels on the corners. Performance tests indicated that this design was inferior for climbing hills and performing sharp turns. The vehicle was modified using 4 motors in fixed positions at the corners with turns executed by running motors in opposite directions on opposite sides of the robot. Sensors on the robot connected to the micro controller provide information for autonomous operation and more accurate control through smoothing algorithms on the software level. The superstructure was designed to minimize weight by using geometric shapes for maximum strength. The robot operates on the RobotC programming language and the Lego NXT micro controller. Results suggest that this design would be effective for terrestrial and potentially extraterrestrial operation.

ENG – 4 AN INVESTIGATION OF THE CAPABILITIES OF AUTONOMOUS ROBOTIC OPERATION
Paata Ugrekhelidze (HS) and Jason Azayev, Robotics Club, James Madison HS

The main goal of this research is to build a robot that could move itself through places that are otherwise unapproachable by humans It could be used during the disasters such as earthquakes, when people are stuck inside demolished buildings and it is dangerous to enter or difficult to find their exact location. In order for such robot to be sufficiently adroit to overcome obstacles, it has to be light but build with strong material. A demonstration robot was constructed using Lego and Tetrix materials and was programmed using RobotC.

The robot must be able to identify a clear path autonomously using sensors to obtain data, and artificial intelligence encoded into the program in order to enable it to make independent decisions based upon its observations.

At present, a demonstration robotic rescue vehicle has been successfully prepared and programmed to obtain data using a radar sensor. It can use this data in order to determine the distance to obstructions or walls in three directions. This enables it to scan for a clear path and then proceed to a new location and rescan. As a demonstration, the robot has successfully moved through simple mazes. Ongoing research will provide the robot with additional capabilities.

ENG – 5 TUNNEL PLUG FLOOD PROTECTION: AIR VS. WATER FOR INFLATION
Yehonatan Hadar (HS), Magen David Yeshiva H.S. and Steven Kaye

Hurricane Sandy was of the worst natural disasters in the history of New York City. The underground subway tunnels experienced flooding of up to ten feet. Even today, several tunnel sections remain out of service as the damage was more severe than anticipated.

The Port Authority of New York is currently installing massive steel moveable gates to provide a seal against water intrusion in PATH tunnels. Another suggested proposal was an inflatable plug that would inflate with pressurized air to seal vulnerable tunnels.

This study involves two phases of experimentation. Initial experiments were performed using physical models to test the concept of the inflatable plug. These models demonstrated that when water pressure acted on the plug it compressed and leakage occurred. Additional tests were performed with a water filled plug. The water inflated plug was successful in preventing the water from entering the simulated tunnel.

Calculations were performed to determine the pressure that would be acting on the front surface of a full size tunnel plug, and the pressure within the plug. Based on the calculations it was determined that within the air filled plug the internal pressure would be less than the pressure of the water, leading to a potential compression of the plug as was the shown in the models. Within the water filled plug, the internal pressure was shown mathematically to equal the external pressure, achieving pressure equilibrium.

In conclusion, a water filled inflatable plug provides protection against the intrusion of water into the highly vulnerable tunnels.

ENG – 6 APPLICATION OF A WIRELESS ELECTRICAL DEVICE FOR THE DETECTION OF EPILEPSY

Raquel A.S. Hosein (HS), Midwood High School, Translational Neuro-Engineering Lab, Polytechnic Institute of New York University, Brooklyn NY

Epilepsy is the third most common neurological disease. It can be found within any age group and gender. A major problem facing epilepsy patients is the randomness of the event. Seizures are difficult to predict without the use of an EEG device, as epilepsy has few outward symptoms. We have constructed and built a wireless device that when integrated with mobile devices, can help to remedy this.

If a wireless device can send real-time data to smart technology, then pre-seizure waves can be detected, and furthermore epileptic patients can prepare themselves for a seizure. In order to test this device, we used a signal generator to create a simple signal. We used that to test that the wireless device was capable of transmitting data in real-time. The test was successful.

CHEM – 1 SYNERGISM BETWEEN AIRBORNE SINGLET OXYGEN AND A TRISUBSTITUTED OLEFIN SULFONATE FOR THE INACTIVATION OF BACTERIA

Rajib Choudhury, **Belaid Malek** (GRAD), Ashwini A. Ghogare, and Alexander Greer Department of Chemistry, Brooklyn College of CUNY, Brooklyn, New York 11210, United States

The reactivity of a trisubstituted alkene surfactant (8-methylnon-7-ene-1 sulfonate, 1) to airborne singlet oxygen in a solution containing *E. coli* was examined. Surfactant 1 was prepared by a Strecker type reaction of 9-bromo-2-methylnon-2-ene with sodium sulfite. Sub-micellar concentrations of 1 were used which reacted with singlet oxygen by an 'ene' reaction to yield two hydroperoxides (7-hydroperoxy-8-methylnon-8-ene-1 sulfonate and (*E*)-8-hydroperoxy-8-methylnon-6-ene-1 sulfonate) in a 4:1 ratio. Exchanging the H_2O solution for D_2O where the lifetime of solution-phase singlet oxygen increases by 20-fold, led to but a ~2-fold increase in yield of the hydroperoxides pointing to surface activity of singlet oxygen with the surfactant in a partially solvated state. In this airborne singlet oxygen reaction, *E. coli* inactivation was monitored in the presence and absence of 1 and by a LIVE/DEAD cell permeabilization assay. It was shown the surfactant has low dark toxicity to the bacteria, but in the presence of airborne singlet oxygen produces a synergistic enhancement of the bacterial inactivation. How the 'ene' derived surfactant hydroperoxides can provoke $^1O_2$ toxicity and be of general utility is discussed.

CHEM – 2 BINDING STUDIES OF SMALL MOLECULES TO TELOMERIC DNA FOR TARGETED SINGLET OXYGEN PRODUCTION

Craig Biegel, **Ryan Khemraj** (UN), Yasemin Kopkalli and Lesley Davenport. Department of Chemistry, Brooklyn College of the City University of New York, Brooklyn, NY

Recent studies in photodynamic therapy (PDT) suggest that small, non-hazardous molecules may be trapped in a matrix and have the ability to generate localized, cytotoxic singlet oxygen upon irradiation. In this study, we have investigated singlet oxygen production from two photosensitive porphyrins, N-methyl mesoporphyrin IX (NMM) and 5,10,15,20-tetrakis (N-methyl-4-pyridyl)-21H,23H-porphine tetratosylate (TMP_YP_4), when trapped within duplex DNA extracted from calf thymus (ctDNA) and model G-quadruplex DNA (qDNA), based on the tandem oligonucleotide sequence (hTTAGGG)$_4$ commonly found in the human telomere. Competition micro-dialysis assays have shown exclusive binding for NMM with qDNA over TMP_YP_4, which binds all types of DNA tested. The high probability of qDNA conformers in hyper-metabolic tissue associated with tumorigenesis, combined with the selectivity of NMM for qDNA, indicates the potential usefulness of this approach for targeting cancerous tumors. We have evaluated the extent of *in-vitro* singlet oxygen production for both porphyrins using the singlet oxygen sensor green (SOSG) fluorescent assay, which shows an enhanced fluorescent signal with increasing irradiation time. UV-visible absorption spectroscopy and temperature-regulated circular dichroism have been implemented in order to monitor the effects on DNA-structure before and after irradiation. In contrast to the non-selective DNA binding of TMP_YP_4, our data reveals enhanced production of singlet oxygen in KCl buffer systems containing NMM bound to the potassium-stabilized qDNA

conformations. In addition, both porphyrins exhibit first-order reaction kinetics during the production of singlet oxygen, which has allowed us to determine the experimental rate constants for singlet oxygen by each porphyrin.

CHEM – 3 "POINTSOURCE" DELIVERY OF A PHOTOSENSITIZER AND SINGLET OXYGEN FOR ERADICATION OF GLIOMA AND OVARIAN CELLS IN VITRO

__Ashwini A. Ghogare__ [†] (GRAD), Imran Rizvi [‡], Tayyaba Hasan [*,‡] and Alexander Greer [*,†]
[†]Department of Chemistry, Graduate Center, CUNY, *Brooklyn College, [‡]Wellman Center for Photomedicine, Massachusetts General Hospital and Harvard Medical School, Boston, MA

We describe a micro-optic device for pointsource delivery of photosensitizer and singlet oxygen aimed at eradication of brain U87 and ovarian OV5 cancer cells. The device has a mesoporous fluorinated silica tip which photoreleases pheophorbide sensitizer for production of singlet oxygen in the nigh vicinity. The results show escalated photokilling rate and enhanced formation of singlet oxygen about midway through the reaction, which can be attributed to a rapid sensitizer release process via an autocatalytic mechanism. The mass of sensitizer released in the extracellular matrix provides positive feedback to assist in the release of additional sensitizer and singlet oxygen. The photokilling of the glioma and ovarian cells was analysed by global toxicity and live/dead assays, where a killing radius around the tip with ~0.3 mm precision was achieved. The pointsource device inference of these results are discussed for a new PDT tool of hard-to-resect tumors, e.g. in the brain.

CHEM – 4 CONNEXIN 32 N-TERMINAL STRUCTURES IN FUNCTIONAL AND NONFUNCTIONAL GAP JUNCTIONS USING ^{1}H NMR

Boris Kalmatsky, __Yuksel Batir__ (GRAD) and Terry Dowd

The amino terminus of gap junction proteins, connexins, plays a fundamental role in voltage gating and ion permeation. We have previously shown with ^{1}H 2D NMR that the structure of the N-terminus of functional connexin molecules contains a flexible turn around G12 (Arch. Biochem. Biophys.490:9,2009) allowing the N-terminus to form a portion of the channel pore near the cytoplasmic entrance serving as a voltage sensor. In this study the mutant G12P was found to form functional channels and to also contain a flexible turn around residue 12. N-terminal mutants of nonfunctional connexin gap junctions G12S, G12Y, W3D and Y7D were also investigated. Some of these N-terminal mutants cause nonfunctional channels in a peripheral neuropathy, Charcot-Marie-Tooth disease. We report that mutants G12S and G12Y form tighter, helical turns around residue 12 stabilized by interactions of their sidechains. N-terminal mutants containing mutations of hydrophobic residues W3D and Y7D either constrained (W3D) or disrupted (Y7D) the open turn around G12. The alteration in the open turn around residue 12, observed in all nonfunctional mutants G12S, G12Y, W3D and Y7D correlates with loss of function due to altered gating or plasma membrane insertion. We propose that loss of the open turn causes the N-terminus to extend out of the channel pore perturbing voltage gating or that this misfolding may target mutants for destruction in the endoplasmic reticulum.

CHEM – 5 USE OF FLUORESCENCE ROTORS FOR STUDYING CROWDING CONDITIONS.

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Microscopic viscosity arising from crowded conditions within cells is important for controlling many cellular processes including transport, assembly and folding of proteins and DNA. Molecular rotors are fluorescent molecules that undergo intramolecular twisting (TICT) motions when in their excited-state, which are sensitive to their immediate solution viscosity. Hindered twisting rotations arising from decreased solution viscosity results in an enhanced fluorescence signal, which can be used to assay crowding conditions. In our studies we have examined the effects of cellular crowding on the properties of the fluorescence rotor, 9-dicyanovinyl julodine (DCVJ). Using synthetic crowding reagents (PEG 200 and PEG 400) to mimic conditions within the cell, we have studied the effects of crowding on DCVJ using fluorescence and UV spectroscopy. The emission spectra of DCVJ exhibit spectral wavelength sensitivity to solvent polarity. In PEG solutions, long-wavelength "red" emission spectra are observed, suggesting a polar environment for DCVJ. However, increasing fluorescence intensities and anisotropy with increasing PEG concentrations correlates with an increasing solution viscosity. Our results suggest that the viscosity probe DCJV is sensitive to cellular crowding and may have applications for *in vivo* fluorescence microscopy mapping of viscosity compartments within the cell.

CHEM – 6 A TRIS-PEGYLATED CHLORIN AS A PHOTOSENSITIZER DRUG FOR USE IN A FIBER-OPTIC BASED PHOTOTHERAPY DEVICE

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A fiber optic has been developed for drug delivery in which a probe tip attached at the distal end of fiber sparges oxygen gas and photocleaves sensitizer molecules. Cytotoxic singlet oxygen is generated site- selectively, which is unlike conventional photodynamic therapy (PDT) that delivers the sensitizer by systemic administration. Aiming at a "third generation" fiberoptic PDT device, PEGylated chlorin e6 photosensitizeres were synthesized with tri(ethylene glycol) attached as ester bond(s) for a 1:1 conjugate at the 17^3-position, 2:1 conjugate at the 15^2- and 17^3-conjugate, and a 3:1 conjugate at the 13^1-, 15^2- and 17^3- positions. These chlorin sensitizers were studied for ovarian OVCAR-5 cancer cell uptake, localization, and phototoxicity. The PEG chlorin conjugates accumulated in the cytoplasm and mitochondria, but not in lysosomes. Higher phototoxicity was correlated with higher numbers of PEG groups, with the tri-PEG chlorin conjugate showing the best overall

ovarian cancer cell photokilling of the series. A Type-II (singlet oxygen) photosensitized mechanism is suggested for the di- and tri-PEG chlorin conjugates; however, a more complicated process based in part on a Type-I (radicals or radical ions) mechanism is suggested for the parent chlorin e6 and the mono-PEG chlorin conjugate. We synthesized a spacer-alkene conjugated tri-PEG chlorin e6 and covalently attached to the fluorinated silica probe tip for fiber-optic guided drug delivery. Our hypothesis is, dampened hydrophobicity of the tri-PEG chlorin on
the fluorinated silica probe tip will show improved photocytotoxicity against ovarian cancer cells.

CHEM – 7 THE USE OF A FLUORESCENCE PROBE FOR STUDYING *IN VITRO* MOLECULAR CROWDING.

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Our studies are focused on the effects of molecular cellular crowding on the secondary and tertiary conformations of biological molecules such as DNA. To this aim, varying concentrations and molecular weight of polar polyethylene glycols (PEG 200 and 400) have been used to mimic the highly *in vivo* packed cellular environment conditions. The fluorescent dye, anilinonaphthalene-sulfonate (both the 1,8-ANS or 2,6-ANS isomers) exhibits sensitivity to both the polarity and micro-viscosity of its local environment through rotation of it phenyl-amino group, and can aid in characterizing model crowding conditions. With increasing concentrations of PEG 200 or 400, 1,8-ANS results in an enhanced fluorescence intensity coupled with a distinct short- "blue" wavelength shift of its emission spectrum. Based on prior ANS/glycerol studies [*Someya & Yui, Anal. Chem., 2010, 5470*], which also report an enhanced fluorescence intensity with increased viscosity of the local probe environment, we suggest our data reflects reduced rotational motion of the ANS phenyl-amino group arising from increased molecular crowding effects. We evaluated the sensitivity of the two ANS isomers, with differing phenyl-amino rotational constraints, to changes in micro-viscosity by measuring the fluorescence intensity and fluorescence lifetimes as a function of varying [PEG]. Our preliminary data suggest that ANS may provide a useful spectroscopic probe for investigating the extent of molecular crowding in both *in vitro* and *in vivo* conditions.

LEGEND:

BIO – Biology

CHEM – Chemistry

CIS – Computer Information Science

ENG - Engineering

ENV – Earth and Environmental Science

HNS – Health and Nutrition Science

MATH – Mathematics

PHYSICS

PSY – Psychology

SCAS – Speech Communication & Arts Sciences