Brooklyn College
The City University of New York

SCIENCE RESEARCH DAY

MAY 10, 2013

ABSTRACT BOOK

SPONSORED BY
NIH RISE, MARC, CSTEP & STEP PROGRAMS
BARNES & NOBLE STUDENT AFFAIRS FUND
GK-12 "CITY AS LAB"

23RD ANNUAL BROOKLYN COLLEGE SCIENCE DAY

Brooklyn College The City University of New York

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 DOES BEING A MONOLINGUAL OR MULTILINGUAL AFFECT A SUBJECTS' MEMORY?

Mushtariy Ikromova (HS), Abraham Lincoln High School, Brooklyn, NY 11235

The present study was designed to test whether there was a relationship between monolingualism, bilingualism, multilingualism and memory. Some previous researchers found that the amount of languages known affects an individual positively, and the more languages an individual knows the better and more positive effects it can have on them. Ninety high school students were randomly selected from Abraham Lincoln High School to test whether the amount of languages known affects an individual's memory by improving performance in a recall task. The subjects participated in both a survey and a memory experiment. In general, through the research it was discovered that subjects who spoke three languages had the best average scores, while monolinguals had lower average scores, and subjects who spoke four and five languages had the lowest average scores from the remembered words. The results gathered from this research supported and at the same time detracted from the hypothesis.

PSY – 2 DOES MOOD AFFECT SOCIAL RECIPROCITY?

Dilnoza Bobokalonova (HS), Abraham Lincoln High School, Brooklyn, NY 11235

The current study was based on testing whether there is a correlation between mood and social reciprocity; meaning does the way people feel affect things surrounding them. Most previous studies have shown that there is a link between those two things by finding out what kind of influence there can be if a person is sad, depressed or happy. In this study, high school students were chosen to be participants by filling out a questionnaire that was based on examples of mood they might begin their morning with, and with examples of the events their days can come to an end. In general, there has been found a correlation between how students felt in the morning and what turned out to be an outcome of their day. It showed that when the individuals began their day from the "right foot", there was almost no possibility of them having a bad outcome in the end, only the one that got better in the process of it. The hypothesis has been confirmed by these results supporting the idea that people should feel good in order to get something good, which generally defines social reciprocity.

PSY – 3 IS THERE A RELATIONSHIP BETWEEN LENGTH OF A STUDENT'S COMMUTE AND THEIR ACADEMIC PERFORMANCE?

Eugene Huang (HS), Abraham Lincoln High School

The purpose of this study was to examine the relationship that sleep and commute time had on a student's average grade. The relationship has a very big impact on education and subsequently the future of America. The research question was answered through a questionnaire-style survey. The data from the surveys was analyzed and showed that those who got less sleep each night, combined with a longer commute time had a lower average grade than those with more favorable factors. In conclusion the hypothesis was supported, as those students with less sleep and longer commutes had a higher sleep debt and lower grades.

PSY – 4 WHAT ARE THE TRENDS IN CHILDHOOD MEMORIES OF PESSIMISTIC AND OPTIMISTC PEOPLE?

Cindy Lau and **Florence Moses** (HS), Abraham Lincoln High School, Brooklyn, NY 11235

The present study was designed to examine the trends of pessimistic and optimistic adolescents' childhood memories. We believed that hopeful people had exuberant childhood memories while cynics had melancholic childhood memories. However, during the process of research, we discovered that shocking events are etched into people's memories and are therefore easier to recall. In order to collect data, fifty high school students between the ages of 13 to 19 were randomly selected to answer survey questions relating to childhood memories and the emotions they felt in accordance to their memories; as well as a personality measure to determine their levels of pessimism and optimism. While analyzing our data, surprisingly, there was no general correlation between adolescent's personalities and the types of memory they recalled; however on the other hand, male pessimists had more happy memories than those of their counterparts. Our results were absolutely unanticipated as they completely disconfirmed our hypothesis. Most adolescents attributed all sorts of emotions to their childhood, and weren't precise in their answers. It is evident that when it comes to childhood memories, personality is not a deciding factor.

PSY – 5 DOES AUDITORY/VISUAL MEMORY RESULT IN HIGHER TEST SCORES?

Kevin Tran and **Nevin Simon** (HS), Abraham Lincoln High School, Brooklyn, NY 11235

The purpose of our project was to determine the correlation between auditory vs. visual tutorials and the performance on a math quiz. Previous research used different methods of testing, such as sentence recall and visual contexts, in which sentence recall showed that subjects had better auditory memory, whereas visual contexts showed that subjects had better visual memory. A group of test subjects based on their age were recruited, and they completed questionnaires followed by a short tutorial based on their modality preferences (auditory or visual memory). Subsequently a mini-quiz was given in order to evaluate their memorization. Based on the data collected, the results showed a general trend in which the modality that our subjects had selected correlated with the overall passing rate of the class; for example, students in the "visual" class predominantly chose pictures as their preferred method of memorization had a 73% passing rate on the quiz; however the "auditory" class which was split on their preferred method of memorization, had a much lower passing rate of 42%. Based on the results, our hypothesis contradicted the sentence recall experiment that proved subjects had better auditory memory, presumably because of the age group and the sample size of our experiment.

PSY – 6 THE EFFECTS OF GOVERNMENT BEVERAGE RESTRICTIONS ON CONSUMPTION

Afra Abid and **Aaron Margulis** (HS), Abraham Lincoln High School, Brooklyn, NY 11235

Previously conducted research had concluded that obesity is a major issue in New York City and can be eradicated through government intervention. The purpose of the current study was to

determine what effect government restrictions, specifically Mayor Bloomberg's recent ban on beverages over 16 ounces, have on people and whether or not they are effective to curb the soaring obesity rates. Thus, we created a survey to question people about their average beverage consumption, before and after the ban, as well as about their opinion on the city's obesity situation. The majority of the participants we surveyed did not display a significant decrease due to beverage restrictions, though most did admit that obesity was a matter of concern in New York, and there were even some participants that displayed an increase in consumption. Contrary to our hypothesis, results indicated that Mayor Bloomberg's ban on certain beverages was not effective.

PSY – 7 WHICH TYPES OF S TUDENTS ARE MOST LIKELY TO EXPERIENCE DÉJÀ VU?

Cindy Serrano and **Michelle Popovitch** (HS), Abraham Lincoln High School

The purpose of the current study was to discover which types of students were more likely to experience déjà vu. Previous studies have shown that déjà vu occurs when the brain falsely recognizes an imagined event as a perceived event. To test these previous studies, thirty five randomly selected students were asked to take a survey and participate in an elicited déjà vu procedure. Through the survey and results of the elicited déjà vu test, we discovered that conscientious students were more likely to experience déjà vu, and agreeable students were less likely to experience déjà vu. Through the data collected we also discovered that the majority of students who experienced déjà vu had grade point averages in the medium-to-high range. This disproved our hypothesis, which was that students with a worse memory and low grade point averages would be more likely to experience déjà vu. Conscientious people are more mindful of details, but in our experiment, it was those particular students who created a false memory while participating in the exam. Determining which types of students are likely to experience this phenomenon also helped determine if déjà vu was related to a student's academic performance; this is vital especially in a world where academics are highly valued. The intriguing sense of familiarity involved in déjà vu is often overlooked; however in a society in which scientific achievements are progressing rapidly, it's imperative that one comprehends the events of the human mind as well.

PSY – 8 RELATIONSHIP OF COGNITIVE STRATEGY USE IN OLDER ADULTS TO PROSPECTIVE MEMORY PERFORMANCE

Avner Aronov (UG), Laura Rabin, Joshua Fogel, Susan Chi, Sarah Kann Department of Psychology, Brooklyn College

Older adults typically demonstrate better performance on prospective memory (i.e., memory for future intentions) tasks carried out in naturalistic settings, which resemble real-life situations, because they compensate by using memory strategies. Additionally, research suggests that older adults are more inclined to employ external rather than internal memory strategies such as writing notes or lists to compensate for prospective memory difficulties. By using external strategies, which require lower levels of cognitive effort, older adults experiencing memory decline may succeed in performing memory tasks. Unfortunately,

research has not investigated older adults' utilization of various types of memory strategies during performance of standardized tasks. The current study investigates the impact of memory strategy use on performance of a prospective memory test that features both time- and event-based tasks measured over short- and long-term retention intervals. We also examine usage rates of external versus internal strategies. In a sample of 165 community-dwelling older adults (aged 70 and above) with varying degrees of cognitive complaints and impairment, we found no use or minimal use for internal strategy use on a standardized task of prospective memory. Moreover, multivariate linear regression analysis showed that increasing number of external strategies was significantly associated with greater prospective memory performance ($p < .05$). Findings are discussed in relation to how external memory strategy use can potentially be enhanced or trained to improve everyday memory ability among older adults.
Supported by the NIH/NIA, PI: Rabin, SC2AG039235

PSY – 9 VALIDATION OF A NEW MEASURE OF PROSPECTIVE MEMORY IN A DIVERSE SAMPLE OF OLDER ADULTS

Sarah Kann (UN), L. Rabin , S. Chi, J. Fogel, & A. Aronov, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210; Department of Finance and Business Management, Brooklyn College-CUNY, Brooklyn, NY 11210

The Royal Prince Alfred test (RPA; Radford et al., 2011) is a novel measure of prospective memory that incorporates both laboratory-based, short-term delay tasks and outside of laboratory, longer-term delay tasks, which are considered to be more ecologically valid. Prospective memory involves remembering to perform previously planned actions while engaged in other ongoing activities at a specific time (time-based prospective memory) or after a certain event occurs (event-based prospective memory). Intact prospective memory is critical for older adults' daily functioning and ability to live independently. For example, tasks such as taking medications on time and keeping appointments rely on prospective memory ability (Einstein, Holland, McDaniel, & Guynn, 1992). The current study is to our knowledge the first to use the RPA in a sample of older adults with the goal of establishing normative data that can be used in the screening process of degenerative diseases such as mild cognitive impairment (MCI). In a sample of 145 community-dwelling older adults (aged 70 and above), cognitive healthy elderly controls outperformed those with MCI with regard to RPA total score ($p<0.001$). Importantly, the RPA was well tolerated and understood by this diverse group of older adults and shows potential promise for use in clinical and research settings.

PSY – 10 WHEN ADULT DYSLEXICS PERFORM BETTER: EVIDENCE FROM COMPREHENSION AND VOCABULARY TASKS

Rita W. El-Haddad (GRAD), Stavros P. Hadjisolomou, and Natalie A. Kacinik
The Graduate Center and Brooklyn College, City University of New York

We predicted that adults with dyslexia would perform worse than controls on spelling, phonological awareness, and various reading tasks. Similar performance to controls was expected on tasks that do not involve the activation of phonological representations. We recruited 17 adults with dyslexia and 23 controls from New York City public and private colleges and from online forums. Both groups consisted

of bilinguals/multilinguals and native English speakers. Socioeconomic status varied, but all participants completed at least some higher education beyond high school. Participants were individually tested on spelling, phonological awareness and reading tasks in one 2-3 hour session. In line with previous research, the dyslexia group performed worse than controls in single-word reading, spelling, nonword reading, and Spoonerisms. Adults with dyslexia also performed similarly to controls on semantic fluency and a non-verbal task as these tasks do not explicitly activate phonological representations. The dyslexia group unexpectedly exhibited similar performance to the controls on Woodcock Johnson (WJ) Reading Fluency, a silent-reading and comprehension task, and WJ Reading Vocabulary. Even more surprising, the dyslexia group performed better than controls on WJ Passage Comprehension, and WAIS Vocabulary. These results of comparable or better performance on comprehension and vocabulary tasks could be explained by the higher socioeconomic status and increased education of the dyslexia group. Furthermore, adults with dyslexia may have acquired compensatory strategies over time through accommodations. Despite this compensation in comprehension and vocabulary tasks, adults with dyslexia still struggle with single-word reading and spelling and show a gap in achievement compared to controls.

Supported by Brooklyn College New Faculty Grant, CUNY Summer Undergraduate Research Program (CSURP), & Doctoral Student Research Grant Program Competition #7

PSY – 11 SMALL ELEPHANTS AND BIG NEEDLES: CAN PERCEPTUAL INFORMATION AFFECT MEMORY AND JUDGMENTS ABOUT THE MEANING OF WORDS?

Samuel Salamon (UN), [1] Rita W. El-Haddad [1,2], Lolly Starr-Glass [1], Kendall J. Eskine [3], & Natalie A. Kacinik [1,2], [1]Brooklyn College and [2]Graduate Center, City University of New York [3]Loyola University, New Orleans

There considerable evidence that representations of word meaning are “embodied” and grounded in our perceptual and motor experiences (Barsalou, 2008; Glenberg, 2010; Hauk et al., 2004; Zwaan et al., 2002). However, the majority of this research has relied on priming and interference procedures, or on measuring or manipulating brain activity. A better test of embodiment theories would be to examine the extent to which perceptual information may be incorporated into existing representations to potentially alter their processing, and whether those effects persist over time. The present study therefore involved manipulating the perceptual appearance of words, specifically font size, to be congruent or incongruent with an object’s actual size (e.g., elephant presented in a large or small font, respectively). Participants were presented with the words in either an explicit or more implicit memory paradigm prior to engaging in a recognition memory test and property judgment task, in the same session and after a 2-week delay. We hypothesized that words presented in a font-size that was either congruent or incongruent with the item’s actual size would result in correspondingly better or worse memory and property judgment performance compared to the middle “neutral” font. However, the results showed that font size did not generally significantly affect how participants represented and processed the words. These findings thus appear to present a challenge for embodied accounts of word meaning, but some potential explanations and issues will be discussed with respect to the type of perceptual manipulation and stimulus items employed in this study.

PSY – 12 THE POTENTIAL OF HYPNOSIS TO IMPROVE FUNCTIONAL MEMORY IN AN ADOLESCENT HIGH SCHOOL POPULATION

Ishaq Khan, **Daniel Groisman** and **Nidha Samdani** (HS), BioMed House, James Madison High School, Brooklyn, NY 11229

The purpose of this research is to investigate whether memory can be affected by hypnosis. High school student volunteers were recruited and asked to sign the IRB release form; parents' signatures were also required. Each experimental subject will receive a series of verbal tests. These tests are designed to determine whether the subject is receptive to hypnosis. These preliminary tests are classified as suggestibility tests. Students that score high on these tests will become the experimental group and students that score low will become the control group. All information collected and all test results will remain confidential.
Hypnosis will be performed by an experienced student magician. Non-hypnotized members of the control group will be evaluated using the same memory tests. Following the completion of these initial tests, students that are receptive to hypnosis should be in the hypnotic state and will take a computerized Stroop test, song recall test, and a personality recall test. Following each experimental hypnosis trial, data collected will include the results of the Stroop test and the recall tests. The preliminary results are expected to show that hypnosis may enhance the memory of the experimental group. It is anticipated that these results will help us to better understand the operation of functional memory.

PSY – 13 LIKE ME: SOCIAL NETWORKING USE AND SELF-ESTEEM IN HIGH SCHOOL STUDENTS

Inique Francois [1], **Rebecca Francois** [1], **Jordan Griffith** [1], **Dannette Lombert** [1], (HS) and Tashana Samuel [2], Brooklyn Academy of Science and the Environment (BASE) High School[1] The Graduate Center and Brooklyn College, City University of New York[2]

Social networking sites such as Facebook, Instagram, and Twitter, have become increasingly popular among high school students. Previous research shows that teenagers use social networking sites as a means to create an identity and express themselves in a different way, and use social networking sites as a means to share experiences with their peers. Is there a relationship between having an established social networking presence and self-esteem? Survey questions were constructed to assess measures of social networking usage and self-esteem in high school students. 95 paper surveys were distributed to students at the Brooklyn Academy of Science and the Environment (BASE) high school in grades 9 through 12. A Pearson r analysis indicated a positive correlation between the number of social networking friends and overall self-esteem; however, there was no association found for the number of personal friends and adolescents' overall self-esteem.

PSY – 14 CAN MUSICICAL TRAINING HELP BENEFIT INTELLIGENCE AND TEST PERFORMANCE FOR STUDENTS?

Jamie Hayes (HS), Brooklyn Academy for Science and the Environment, Brooklyn, NY 11225 and Leonard Robertson, Brooklyn College CUNY, Brooklyn, NY 11210

Research was conducted in order to find out if musical training affects intelligence and test performance in a positive or negative way. Practicing instruments requires the cerebrum, which is the part of the brain that controls memory. This practice may allow students to better remember things while taking tests and therefore may enhance their test performance. Previous experiments conducted show that students that played instruments performed better on tests than students that did not play instruments. In this research, students in grades 9-12 were given the same test and placed under the same conditions. Results show that the average test scores from students who are musicians was higher than the average of non-musicians. It was also noted that the amount of time an individual spends playing an instrument can also affect test performance.

PSY – 15 THE EFFECT OF THE EXPERIMENTER'S RELIGION ON EXPLICIT ATTITUDES

Zainab Saleem (HS), Midwood High School; Karla Felix, Department of Psychology, Brooklyn College – CUNY

The effect of the experimenter's religion on the participant's attitudes was explored in this study. Participants were asked to answer questions on religious literacy by an experimenter who was either Muslim or religiously neutral. After these responses were recorded, the participant was given questionnaires which they answered independently. The experimenter's religion was expected to have an effect on how the participant answers these questions about explicit attitudes. It was hypothesized that less religious prejudice would be shown toward a neutral experimenter and more negative associations with the experimenter of a religious out-group. The religiosity of the participants was also compared to the means of their results on the intergroup scales. T-tests were performed and means were calculated for the intergroup scale responses, split by experimenter. The participant group was split in to high and low religiosity and statistical differences were found for certain questions asked in different intergroup scales. The analysis of the first hypothesis indicates that the experimenter's religion did not have a significant effect on the participant's attitudes, with the exception of certain statements. The analysis of the second hypothesis showed that participants with high religiosity responded to having a better understanding of the two religion's view of the world.

PSY – 16 AN OBJECTIVE COMPARISON OF ARTISTS' AND NON-ARTISTS' SENSITIVITY TO SELCTING VISUAL INFORMATION IMPORTANT IN DRAWING

Edward Francis Ward (UN), Emma Snodgrass, and Aaron Kozbelt. Department of Psychology, Brooklyn College-CUNY, 2900 Bedford Ave. Brooklyn, NY 11210

Previously, researchers have argued that artists' advantages in drawing derive from an ability to overcome built-in biases in perception, which are useful in every day object recognition and spatial navigation, but which undermine visually accurate depictions. Others researchers have argued that overcoming such biases is insufficient to explain artist's drawing advantages; and in studies by Kozbelt et al. (2010), Ostrofsky et al. (2012), evidence was found that artists are superior at selecting the most relevant visual information to include in a depiction. This study aims to build on that evidence, and investigate the psychological functions which contribute to

how artist and non-artists create simplified versions of an image, when permitted only a relatively small number of pixels to fill in. Participants are given a stimulus for the visual selection task; a face which is presented printed on a white sheet of paper inside a clear plastic folder. Grid lines are superimposed over the photo as a guide for participants to put down small square pieces of tape, to complete the task of creating a pixelated rendering of the face that is as accurate as possible given the constraints of the medium. From the results of this task, we are able to measure how sensitive each participant is to the appropriate visual selection of information, and compare artists and non-artists on this measure. Through an objective measure of signal detection theory, we expect to see that artists will show a greater sensitivity to selecting the most important visual information.

PSY – 17 DIFFERENCES IN PROCESSING BETWEEN THE MAGNOCELLULAR AND THE PARVOCELLULAR VISUAL PATHWAYS

Anna Lemesheva (UN) and Daniel D. Kurylo, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

The magnocellular channel processes low spatial frequency stimuli and responds to shades of gray, while the parvocellular channel processes high spatial frequency stimuli and responds to color. Magnocellular functions are thought to operate at a fast rate. It is predicted that the critical stimulus duration for the magnocellular system is shorter than it is for the parvocellular system. We had two conditions: one that biases toward the magnocellular channel and the other that biases toward the parvocellular channel. We measured processing of foveal and peripheral stimuli. Both stimuli were within acuity limits. For foveal viewing, processing was beyond the limits of the computer display, and thereby exhibited a floor effect. For peripheral viewing (a retinal eccentricity of 22 degrees) the magnocellular stimuli were discriminated at a critical stimulus duration of 11 ms, while the parvocellular stimuli required 44 ms. These results are consistent with previous research that the magnocellular channel processes information more quickly than the parvocellular channel, which may be related to the need for processing dynamic stimuli, such as motion and flicker.

PSY – 18 COULD BIRTHPLACE BE A MEDIATOR BETWEEN AGREEMENT WITH AGE STEREOTYPING AND BEHAVIOR?

Kadija Ny'Omi Williams (GRAD), (Brooklyn College, The City University of New York), Elisabeth Brauner (Brooklyn College, The City University of New York),

We understand stereotypes to be generalized ideas about the characteristics, attributes, and behaviors of particular groups and their members. In navigating our environment we depend on stereotypes when there is lack of information or time for deeper processing. Stereotypes are constructed over time from a variety of sources, including social groups like family and friends, and the media. Because these sources are frequently traversed the stereotypes are repeatedly activated (Dixon, 2000). These ideas may not only affect how we perceive or behave toward other people, but our attitudes can affect our self-perceptions and behaviors. Our exploratory

study examines the effects of attitudes toward age on behaviors such as memory performance and speed. Results suggest that the relationship between age-related attitudes and behaviors may be mediated by birthplace. Although the results were not all statistically significant, generally speaking participants who agreed with age stereotypes were slower to do the task than participants who did not agree with age stereotypes, and participants who were foreign born were slower to complete the task than participants who were US born. However, when birthplace became a factor Foreign born participants who agreed with age stereotypes and were faster to do the task than Foreign born participants who did not agree with age stereotypes, and Foreign born participants who agreed with age stereotypes were faster to do the task than US born participants who agreed with age stereotypes. These incongruent findings suggest that birthplace may mediate the relationship between age attitudes and behaviors.

PSY – 19 THE EFFECT OF PRIMING ON CONTOUR INTEGRATION TRAINING

Jay A. Jeschke (GRAD), Daniel D. Kurylo, Psychology Department, Brooklyn College

Visual contour integration training, as well as priming contour detection, have both been shown to improve the ability to recognize contours embedded in visual noise. However, the possible benefit of combining training as well as priming has not been explored. The aim of the present study was to determine if contour integration training with added priming cues would improve contour detection. Experiments were conducted in which all subjects first viewed a series of Gabor element displays with varying degrees of jitter in contour segment alignment. Subjects indicated the direction which the embedded contour was pointing. From this task baseline threshold for contour recognition was established. Subjects were then randomly assigned to training with contour priming or without contour priming, starting after baseline assessment. Training continued for two more consecutive days. After training on day three, all subjects were given the same assessment as given at baseline. Results from pre-training psychophysical measures indicate that contours are detectable up to a jitter deflection of 11°. Thus far, results validate use of the chosen stimulus parameters, as well as specifics of the psychophysical methods. Given that contour integration relies on coactivation of orientation selective cells in early visual areas, positive results would suggest that contour priming aided the cooperative effort of these cells. These results have implications for the design of cognitive remediation programs aimed at improving basic sensory processing.

PSY – 20 RECOGNITION OF NATURAL SCENES AND PROCESSING TIME

Pamela Husbands (GRAD), Daniel D Kurylo, Department of Psychology, Brooklyn College, Brooklyn, NY 11210

Human vision is a dynamic and active process, and oft times one single glance is enough to make sense of a natural scene. Previous research has determined that processing time to make sense of a scene varies minimally. However, studies have indicated that a very short duration of image exposure afforded humans the ability to decidedly detect a natural scene category. Studies also indicate that human observers display sensitivity to information about global properties during a short duration of exposures to natural scenes. Three goals were addressed in this study: (1) processing time for natural scene recognition; (2) to determine how much information can be gathered with brief exposure to a natural scene; (3) processing time for recognizing global properties vs local features. Three categories of natural scenes were used. Participants viewed images of natural scenes displayed on a computer monitor, and identified scene categories. In one condition, scene categories were identified (global properties); in a separate condition, specific items in the scene were identified (local features). Evaluation of results from this study indicate that for complex natural processing local features contribute to global perception, although processing of local features require significant processing time which is likely related to other cognitive processes such as visual search and visual short term memory.

PSY – 21 THE EFFECT OF PERCEPTUAL ORGANIZATION ON RECOGNITION AND CATEGORIZATION OF COMPLEX SCENES

Beliz Hazan (GRAD) and Daniel D. Kurylo, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210 and The Graduate Center of CUNY, New York, NY.

For complex stimuli found in natural scenes, categorization is based upon organizing and identifying unified forms. Whereas much of the previous research on complex scene categorization has examined the role of global processing, less is known about processing at the level of constituent features. To investigate this issue, analysis was made of the contribution of constituent features on the ability to categorize complex images. Consistent with hierarchical models of complex scene perception, it is hypothesized that these fundamental components of form perception play a significant role in categorizing natural scenes. Participants viewed images of natural and man-made scenes that were systematically degraded by an occluding mask. Reduced stimulus integrity, which is produced by the occluding mask, is derived by a stimulus mask (random array of solid white circles) superimposed on the image. Each image varied along 26 levels of occlusion, presented in a series from the most occlusion to the least. For each image, the level of degradation was progressively reduced until observers were able to accurately categorize images, thereby establishing an index of perceptual ability. Comparisons were then made across separate conditions, in which color, grayscale, low pass spatial frequency (LPSF), high pass spatial frequency (HPSF), contour information is selectively extracted from images. In color, grayscale, LPSF and HPSF conditions, 79%, 67%, 35%,52%, 54% occluded scene could be recognized, respectively. These results show that the specific

stimulus features of color, low and high spatial frequency components, and surface texture, contribute to perceptually grouping local components of complex, natural scenes.

PSY – 22 INQUIRY-BASED PEDAGOGY IN THE URBAN CLASSROOM ADVANCING SELF-EFFICACY IN SCIENCE

Tashana Samuel [1] (GRAD), Adam Johnson [2], and Amy DeFelice [1]
The Graduate Center and Brooklyn College, City University of New York[1]
Florida State University[2]

Inquiry-based pedagogical theory argues that science learning is better facilitated by active engagement with the research process, as opposed to indirect instruction through a lecturer or textbook. What has been studied less frequently in the literature is the effect of inquiry-based learning on student attitudes about science and their efficacy in science. Content knowledge is not the only goal of instruction, especially for high school learners in urban settings who may have been dis-identified or disengaged with academics. Fostering personal identification with academics, self-efficacy in learning, and a potential career commitment to the sciences is as equally valid and desirable an outcome as is the transmission of content knowledge. The National Science Foundation funded Graduate Teaching Fellows in K-12 program (NSF-GK-12) at Brooklyn College pairs graduate students in the sciences with high school science teachers in order to improve and augment classroom science education. The Graduate Teaching Fellows have been working with Brooklyn Academy of Science and the Environment (BASE) high school in Flatbush, Brooklyn, for the 2012-2013 school year; and GK-12 itself has been working with this school since the beginning of the 2007-2008 school year. A pre- and post- survey measuring students' perception of science was administered to the BASE high school students in science research courses before and after the graduate teaching fellow intervention. Survey results indicate that providing an extended inquiry-based research opportunity for the science research students has increased their attitudes toward the value of science, self-efficacy in science, and student commitment to pursuing science as a career possibility.

PSY – 23 EFFECTS OF INSTRUMENTAL TRAINING CONTEXT ON PAVLOVIAN-TO-INSTRUMENTAL TRANSFER (PIT)

Ebony M. Holland (UN) & Andrew R. Delamater, Department of Psychology at Brooklyn College-CUNY, Brooklyn NY 11210

The present study addresses whether the contexts in which R-O associations are learned have an impact on the expression of specific PIT. Rats learned to make two spatially distinct instrumental lever press responses for different reinforcing outcomes (e.g., Left-Pellet, Right-Sucrose). For eight animals this training took place in two dissimilar contexts (Group Differential). A second group of animals learned both response-outcome (R-O) relations in both contexts (Group Non-Differential). In a second phase rats were given Pavlovian training in a third context in which rats received pairings of one conditioned stimulus (CS) with one of the outcomes used previously and a second CS with the other outcome (e.g., Light-Pellet, Tone-Sucrose). During testing, the impact of the Pavlovian stimuli on instrumental lever pressing was

assessed and these tests occurred in either the Pavlovian or the instrumental training contexts. The two CSs significantly increased the response associated with the same specific outcome as that signaled by the stimulus (e.g., Light only increased Left lever responses and Tone only increased Right lever responses), but this effect was only seen in Group NonDifferential. Additionally, this effect was not dependent upon the context in which animals were tested, suggesting that the performance problem in Group Differential was not related to a retrieval deficit as hypothesized. These data suggest that rats given instrumental training in different contexts fail to learn specific instrumental R-O associations, probably because different context-outcome associations overshadow that learning. These data identify boundary conditions whereby learned cues can influence behavior.

PSY – 24 THE EFFECTS OF ATTENTION ALLOCATION ON PERCEPTUAL GROUPING

Sibel Akyuz (GRAD) and Daniel D. Kurylo, Psychology Department, Brooklyn College

Using artificial, experimental stimuli, previous research indicated that perceptual organization does not occur without attention. In order to examine these effects in a complex, dynamic scene, we measured grouping performance in a dual performance task. Specifically, perceptual grouping by alignment (the principle of Good Continuation) was measured when it was performed either alone or at the same time as a visual tracking task. We also investigated whether dual-task effects interacted with level of task difficulty. We hypothesized that grouping ability will decline with reduced attention resources, and that this effect should be amplified with increased task difficulty. Participants viewed 30 sec video clips in which a beach ball was passed among a group of actors, each of whom wore a colored line at different elevations. In separate conditions, subjects indicated (1) errors in the sequence of ball passing, (2) alignment of the lines, or (3) both tasks at the same time (dual task). Mean reaction time to identifying aligned elements was 1.6 seconds. This value didn't notably change in the dual-task condition, nor did it notably change across levels of difficulty. These results indicate that under natural viewing conditions, with complex dynamic stimuli, attention resources are adequate to recognize regularities in the scene.

PSY – 25 THE EFECTS OF PSYCHOLOGICAL INTERVENTIONS ON DISEASE ACTIVITY AND INFLAMMATORY BIOMARKERS IN CHILDREN AND ADOLESCENTS WITH INFLAMMATORY BOWEL DISEASE (IBD)

Mark A. Edouard (UN), Laura C. Reigada, Claire J. Hoogendoorn, Brooklyn College-CUNY

Inflammatory bowel disease (IBD) is an autoimmune disease in which the body's own immune system attacks elements of the digestive system, leading to symptoms such as abdominal pain and diarrhea. The two most common types of the disease are ulcerative colitis and Crohn’s Disease. Youth diagnosed with IBD are more likely to experience anxiety symptoms. Stress and anxiety can negatively alter immune function and can play a role in IBD disease management and activity. The purpose of this study is to examine whether psychological interventions targeting anxiety symptoms impact IBD disease activity post treatment. Additionally, we aim to test disease outcomes based on intervention type.

Twenty two participants with IBD and comorbid anxiety, ages 9-17 (*M*=13.14; *SD*=2.08) were randomly assigned to a cognitive behavioral intervention or non-directive supportive approach. All patients attended a 13-weekly session followed by 2-monthly boosters. Psychological and disease-related measures were collected pre-, post-intervention, and 3-months following treatment completion. Disease activity was measured using physician report and biomarkers associated with inflammation (i.e., albumin and hematocrit), which were collected through routine medical care blood draws. Results showed a significant main effect of time for albumin, somatic symptoms, anxiety, and illness severity (p<.05). There was a significant main effect of condition for albumin as well (p<.05). There was lastly an interaction effect between albumin by condition and disease activity by Crohn's Disease (p<.05). There were no other significant main effects or interactions.

PSY – 26 EMOTION DYSREGULATION AND PSYCHOPATHIC PERSONALITY: A PSYCHOPHYSIOLOGICAL STUDY

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Psychopathic personality traits include emotion deficits and antisocial behavior. The prevalence of psychopathic personality is about 1% in the non-clinical and non- forensic populations. Previous literature has demonstrated that psychopathy is associated with lower baseline heart rate (HR) and HR reactivity which are influenced by both parasympathetic and sympathetic branches of the autonomic nervous system (ANS). This study aims to examine the effect of the parasympathetic branch of ANS (as indicated by respiratory sinus arrhythmia (RSA)) and its association with psychopathic personality. Approximately 70 college students from Brooklyn College participated in the study. Psychopathic traits were assessed using the Psychopathic Personality Inventory-Short Form (PPI-SF) and Levenson Self-Report Psychopathy Scale (LSPS). Electrocardiogram (ECG) and respiration rate were recorded during a 2-minute rest period and also when participants completed a conditioning task. There were 10 CS- (high pitch tone) and 10 CS+ (low pitch tone, four of which were followed by a picture of pit bull dog and loud noise). Total psychopathy scores from PPI-SF and LSPS were not significantly correlated with the RSA measures. However, higher emotional deficit (PPI-SF Factor 1) was associated with lower RSA reactivity during the conditioning task and impulsive-antisociality (LSPS secondary psychopathy) was positively related to baseline and post-task RSAs, and RSA reactivities during the conditioning task. This study for the first time examined the effect of parasympathetic nervous system on heart during a conditioning paradigm, and findings suggest that different mechanisms are associated with the two factors of psychopathy in the non-incarcerated non-institutionalized population.

PSY – 27 IS THE NOVEL STIMULUS IN EXTERNAL INHIBITION AN ACTIVE INHIBITOR?

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External inhibition is a simple behavior phenomenon where the presentation of a conditioned stimulus (CS) together with a novel stimulus is found to elicit less responding than

presentations of the CS alone. Most theories of associative learning explain this finding either as resulting from generalization decrement (Pearce, 1987) or because of the replacement of excitatory elements (Wagner, 2003). However, Ghirlanda (2005) has proposed a model of associative learning, according to which stimuli that are very different from a CS acquire inhibitory properties during conditioning. On this account, external inhibition is caused by active inhibition from the novel stimulus. To evaluate this hypothesis, we employed two conventional tests used to detect whether a stimulus is inhibitory or not. Two groups of participants were first instrumentally conditioned to respond to a specific stimulus in one position on a computer screen. Following acquisition, one group was tested with a summation test, where we measured responding to presentations of the CS together with a second stimulus shown on the opposite side of the screen. A second group was tested with a retardation test, in which we measured the rate of acquisition to a stimulus presented on the opposite side of the screen. The conjectured inhibitory stimulus did not pass either of the two tests. Further research is needed to determine whether the tests failed because the novel stimulus is in fact non-inhibitory, or for other reasons, such as the particular experimental design being too weak to detect the inhibitory properties of the novel stimulus.

PSY – 28 THE EFFECTS OF STIMULUS DURATION ON CONTRAST SENSITIVITY IN RATS

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Studies using reaction times (RTs) for the detection of Gabor patches (sinusoidal gratings in a Gaussian envelope) have revealed characteristics by which the visual system responds to varying contrast and spatial frequency. In humans and other primates, parallel neural networks (magnocellular and parvocellular pre-cortical channels) function in an independent manner, suggesting a modular and specialized organization for visual processes. The goal of the current study was to determine whether exposure time of a stimulus (Critical Stimulus Duration [CSD]) affects contrast sensitivity in rats, and to determine whether CSD effects interact with spatial frequency, such that higher spatial frequencies required longer CSDs. Rats were tested in specialized operant conditioning chambers in which stimulus parameters could be specified relative to the corneal surface. Rats were initially trained to detect Gabor patch onset. RTs were collected from the onset of stimuli to the start of a behavioral response. RT frequency distributions, displayed as histograms, were compiled across varying contrasts, spatial frequencies, and stimulus durations. Results indicated that RT distributions flattened with decreased contrast, thereby allowing measures of contrast sensitivity. Based upon these measures, it was determined that contrast sensitivity decreased with increased spatial frequency. Additionally, for high spatial frequencies, a trend existed in which contrast sensitivity decreased with shorter duration times. Results indicate that changes in RT distribution suggest two different mechanisms may be functioning, one carrying low spatial frequency information, and the other carrying high spatial frequencies. These results are consistent with characteristics of the two pre-cortical channels previously found in primates.
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PSY – 29 10,000 HOURS IN 10 MINUTES

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Previous research has shown that gaining expertise in skilled motor tasks such as playing a musical instrument or typing on a keyboard takes about 10,000 hours. But what if we could produce a simple laboratory model of skill learning in 10 minutes? In this study, we tested participants' ability to type the alphabet on a newly arranged keyboard compared to their ability to type the alphabet on a regular QWERTY keyboard. We then asked them to remember where the keys were placed on these in order to examine the type of learning involved in this task. Our results were examined in three parts. First, we found that participants got about 2.5 times faster in typing the alphabet on the irregular keyboard over 20 trials, making a perfect learning curve. Second, after analyzing accuracy in the memory task, we found that participants performed significantly better than chance in both conditions, yet only averaging about 30% to 40% correct. For incorrect responses, participants were only about one key away on average. This implies that both explicit and implicit knowledge are active during this sequence learning task. Yet, when we examined reaction times for individual keys pressed – only keys that they guessed correctly on the memory task and only keys that they guessed incorrectly on the memory task – we found no significant differences in those learning curves. This implies that implicit knowledge drives the learning for this skilled motor task.

PSY – 30 MONK PARAKEETS (*MYIOPSITTA MONACHUS*) PREFER FRUIT TREE WOOD (*ROSACEAE*) FOR THE CONSTRUCTION OF NESTS

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The monk parakeet population in Brooklyn poses a threat to telephone and power lines through their nest construction activities. We studied the nest composition to better understand their nest-building behavior. We hypothesized that the monk parakeets have preferences for the types of wood they use to build their nests. We collected samples of sticks from three different nests in the area around Brooklyn College and measured their lengths, diameters and weights (n = 600, 200 per nest). We also determined the species of tree from which each measured stick was taken. The nest materials contained sticks from the Ailanthus, Ulmaceae, Rosaceae, Aceracae and Quercus genuses. Rosaceae was overwhelmingly frequent in the samples (twenty times more common than the next most common tree species). Scatterplots and histograms allowed us to visualize the structure and composition of each nest. In the nest sample, the stick sizes ranged from 1-3 grams in weight and 15-40 centimeters in length. The Rosaceae sticks in the sample are not different from the other stick species in size or weight. We conclude that monk parakeets may prefer Rosaceae sticks for one of three reasons: Firstly, Rosaceae are fruit trees. So sites where they forage for food might also be their source of nest building material. Secondly, fruit wood may contain a special chemical that protects the parakeets from harmful parasites. Lastly, the structure of the Rosaceae stick is bent and bumpy, so the parrots may take advantage of these or other mechanical properties for good nest construction.

PSY – 31 DETECTING CHANGES IN NEURONS WITHIN THE HIPPOCAMPUS OF MICE THAT LEARNED A SPATIAL MEMORY TASK

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The learning experience is thought to recruit the function of neurons. These neurons form networks wherein the learning experience is encoded and maintained as memory. A central goal in neuroscience is to identify changes in neurons caused by the learning experience. This study was conducted in order to identify molecular changes in neurons modified by a learning experience within a brain structure known as the hippocampus. To do so, potential changes in the expression of PARP-1, a specific protein known to be involved in learning and memory, and PAR, the activity of PARP-1, in mice trained in a spatial memory task were compared to control subjects. Tissue slices from the mouse hippocampus were processed in order to visualize PAR and PARP-1 amounts in hippocampal CA1 neurons. An imaging data analysis revealed a difference between trained and untrained mice at a particular intensity range for PARP-1 and PAR expression, suggesting a potential method to identify neurons recruited by learning and memory processes.

PSY – 32 THE EFFECTS OF SELF ESTEEM AND PUBLIC SELF COUSCIOUNESS ON SELF EXPRESSIVE BEHAVIOR

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The goal of this study was to analyze the effects of self-esteem and public self-consciousness has on an individual self-expression of their guilty and prideful moments. This study involved participants detailing moments in their lives where others were proud or disappointed in them in a confessional video setup. This was done by participants placed in front of a live web camera where a researcher would ask them to share their stories as it was being recorded. The stories were then analyzed by coding eight specific behavioral moments such as justifying guilt or pride, others aware of prideful or embarrassing moments, or self-expression of guilt or pride using the Nodules Software. We believed that individuals with high self-esteem would justify their actions within their guilty expression more compared to low self-esteem participants and, resolve their guilt with positive conclusions. In contrast we hypothesized that low self-esteem participants will reassure themselves in their guilty moments within their stories. The data showed individuals with high self-esteem were more likely to justifying their guilty actions than low self -esteem participants; $t(14) = 1.685$, $p = .114$. Individuals with high public self-consciousness were also more likely to justify their actions as well, $t(14) = 1.685$, $p = .114$. It was concluded that individuals with high self-esteem and high public self-consciousness were more likely to justify their actions compared to participants who were not. It was also shown that individuals with low self-esteem were more likely to be influence on expressing other's aware of their prideful or guilty actions.

PSY – 33 DISASSOCIATION WITH BODILY REACTIONS IN MORAL DILEMMAS IN PSYCHOPATHY

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Previous literature has shown that psychopathic people are more likely to report inaccurate subjective bodily responses compared to objective measures when presented with stress inducing tasks. However, prior research has been focused on individuals from employment agencies and some have criminal records. It is unknown if this dissociation can also be seen in non-incarcerated non-incarcerated college population. This study aims to address this issue. It was hypothesized that this bodily disassociation would be associated with psychopathic personality in a group of college students during a moral judgment task that induces moderate stress.

Heart rate data were collected in 66 college students while they were presented with 15 scenarios and were asked to answer yes or no to questions on a computer screen. The questions include personal moral (direct physical harm), impersonal moral (indirect harm), and neutral (no harm) dilemmas. The Psychopathic Personality Inventory – Short Form (PPI-SF, Lilienfeld et al., 1996) was administered to measure psychopathic levels, while a questionnaire was given out for bodily sensation self-reports. Heart rate levels (objective scales) were compared with the self-reported subjective bodily sensation data. As predicted, people high on the psychopathic scale (particularly the cold-heartedness factor of psychopathy) were more likely to show the dissociation between physiological recording and verbal reports.

This study extended prior literature by working with a different population: students in an urban, intellectual environment. Findings suggest that a deficient somatic marker in psychopathic individuals may contribute to their inability to accurately identify and recognize their own somatic states.

PSY – 34 EFFECT OF A HUMAN AUDIENCE ON THE CALLING BEHAVIOR OF MONK PARAKEETS (*MYIOPSITTA MONACHUS)*

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Audience effects often indicate the existence of higher cognitive abilities in social animals. Monk Parakeets are gregarious, successful invasive species that are known to possess other higher cognitive abilities. We hypothesized that monk parakeets are sensitive to audience size. To test this hypothesis we recorded the calls of monk parakeets at their nests following the arrival of a single person or a group of nine people. We analyzed these recordings to determine the number of distinct calls per minute and percent of time the parrots spent vocalizing as a group (chattering) in one minute intervals for the 5 minutes after single person or group arrived at the nest. We also counted the number of parrots present at the nest during each observation. From these numbers we determined the rates of vocalizations per bird per minute. We found that the rate of chatter was higher when a single observer was present and the number of calls was higher when a group was present. The average rate of chatter or calls was consistently higher in one or the other condition over all five minutes of the observation.

Although it is difficult to interpret the contradiction between increased chatter with small group size and decreased calls with larger group size, these combined results suggest that monk parakeets possess an audience effect and are sensitive to the size of groups of human observers.

PSY – 35 IS MORE PARIETAL ACTIVATION BETTER OR WORSE FOR MEMORY? A BRAIN STIMULATION STUDY.

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Recent studies using functional magnetic resonance imaging (fMRI) have shown that increased activation in the posterior parietal cortex (PPC) during memory encoding correlates with greater forgetting at retrieval. In this study, we used transcranial direct current stimulation (tDCS) to directly manipulate brain activity in the PPC to determine whether the PPC has a direct role in successful encoding. We applied anodal CP3/cathodal CP4 tDCS to enhance brain activity in PPC when participants studied words. We hypothesized that greater activity in this region would interfere with successful encoding and lead to greater subsequent forgetting in a retrieval test. Fourteen right-handed English-speaking volunteers (aged 18-35, 11 females) participated in this study. Participants received either active (2 mA for 20 minutes) or sham stimulation during the study phase and returned the following day for a recognition test. At recognition, participants were presented words studied the day before and words that were not studied. They were asked to indicate whether they remembered the word as studied ("old"), non-studied ("new"), or not sure ("pass"). Participants were asked to return 3-5 weeks later to repeat the tasks using a different list of words under the alternate tDCS condition. Preliminary analyses showed a trend towards better memory (corrected recognition; Hits-FA) in the sham condition (0.45 $\pm$ .05) compared to active stimulation (0.40 $\pm$ .05; $p < 0.08$, one-tailed). Although data collection is ongoing, our preliminary findings suggest that the PPC does play a direct role in encoding, and that increased parietal activity leads to worse memory performance.

PSY – 36 LIFE SATISFACTION IN OLDER ADULTS: THE ROLE OF VARIOUS DEMOGRAPHIC, PSYCHOSOCIAL, AND HEALTH-RELATED VARIABLES

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Life satisfaction is an important component of overall well-being and its role in positive and aversive physical, social, and psychological outcomes is an area of active scientific inquiry. Recent research suggests that older adults are at risk for reductions in life satisfaction and that sharp declines may be stronger predictors of proximity to death than actual age. As such, it is important to identify the variables associated with both the reduction and maintenance of life satisfaction in older adulthood. We investigated various demographic, social, objective and subjective cognitive, exercise, emotional, and health variables to determine their associations

with self-reported life satisfaction. Participants were 165 non-demented, community-dwelling older adults from the Bronx, NY (mean age = 81.9 (SD=5.14); mean years of education = 14.4 (SD=3.37). Almost two-thirds of participants were women and slightly more than one-third were of non-white race/ethnicity. Multivariate linear regression analysis showed that increased perceived social support and decreased depressive symptoms were significantly associated with increased life satisfaction. None of the demographic, cognitive, exercise, or health variables were significantly associated with increased life satisfaction. These findings demonstrate the importance for professionals working with elderly adults to attend to the quality and reciprocity of older adults' social networks as well as subclinical depressive symptoms. Interventions tailored to monitor and buffer against decline in these key variables may be of paramount importance for successful aging and survival in older adults.

PSY – 37 EMOTIONAL AND PHYSIOLOGICAL REACTIVITY TO POSITIVE MOOD-INDUCTION: A DIMENSIONAL APPROACH TO DEPRESSION USING A NON-CLINICAL SAMPLE

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Previous research emphasizes the role of negative mood and negative mood induction (MI) in clinical depression, and exploration of its underlying neurobiology. More recently, literature had examined the role of positive mood and positive mood MI on depressive symptoms and psychophysiological and neurobiological responsivity in clinical, high-risk and non-clinical samples. To date, there is a dearth of studies concurrently examining the effects of positive mood on subjective mood and psychophysiological (i.e., skin conductance; SC) response in non-clinical samples. The current study aimed to address this gap by examining self-reported depressive symptoms in relation to subjective mood and objective arousal at baseline and in response to a positive mi paradigm, among non-clinical individuals (76 females/71 males) ages 18-33 years. Measures included the center for epidemiological scale-depression (CES-D), the self-assessment manikin (SAM), and four conditions of a positive MI paradigm using pictures from the International Affective Picture System (IAPS) and a musical excerpt. Measurements included baseline SC and SC responsivity to, and SAM ratings before and after, the MI procedures. Results indicated: 1) higher CES-D scores were associated with less happy baseline SAM ratings, 2) no significant relationships among CES-D scores and SC indices, and 3) a relationship between CES-D and SAM change score, only in the moderate arousal group (i.e., higher CES-D was associated with a greater increase in positive mood from pre-to post-MI). Findings hold implications for understanding depression from a dimensional perspective with consideration of positive mood effects on subjective and objective indices of well-being.

PSY – 38 *IS ELECTRODERMAL CONDITIONING ASSOCIATED WITH MORAL DECISION MAKING?*

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Electrodermal fear conditioning is a form of associative learning. When a neutral stimulus is paired multiple times with a negative stimulus, the neutral stimulus elicits the same somatic

fear response. Following the Somatic Marker Hypothesis that states that conditioned emotional responses assist the decision-making process, reduced electrodermal fear conditioning is hypothesized to be linked to reduced electrodermal responses during contemplation of moral dilemmas, which leads to more utilitarian responses in moral dilemma tasks.
One hundred and one Brooklyn College students were recruited to participate in this study. All of the participants underwent two tasks. In the conditioning task, they were presented with two different tones. One tone was followed by an aversive stimulus that included an image of a pit bulldog and a loud noise while the other tone was not. Participants also were presented with fifteen dilemmas and asked if they would endorse the action. Electrodermal activity was recorded during the two tasks.
Students showed stronger somatic responses to aversive stimuli than to neutral tones. Inconsistent with our hypotheses, no significant relationship between electrodermal conditioning and electrodermal responses during moral dilemmas or between conditionability and utilitarian responses were found.
This is the first study attempting to demonstrate that basic classical conditionability may partially contribute
to producing utilitarian responses. Results suggest that the unconscious somatic responses may only play a partial role at most in the process of moral decision making.

PSY – 39 EMOTION DYSREGULATION IN STUDENTS WITH PSYCHOPATHIC TRAITS

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Respiratory sinus arrhythmia (RSA) is an index of the parasympathetic-linked cardiac activity, which has been associated with emotion regulation. Reduced RSA activity and reactivity, indicating hypoarousal and emotion dysregulation, have been linked to externalizing behavior in children and aggression and in adults (Beauchaine, 2007, Murray-Close & Rellini, 2012). Consistently noted in literature, psychopathic personality is known to be associated with unusual emotional experiences (Steuerwald & Kosson, 2000) and heightened aggressive behavior. However, little research is known about the relationship between RSA and psychopathy. This study aims to address this issue by measuring the parasympathetic nervous system reactivity via measures of RSA during a moderate stressful task and self-report psychopathic traits in a group of college students. It was hypothesized that psychopathic personality traits would be negatively associated with RSA baseline activity and reactivity. Fifty-eight students from Brooklyn College answered a total of 15 questions on personal moral, impersonal moral, and non-moral dilemmas presented on a computer screen. Their electrocardiography and respiration cycles were measured during the decision-making task and also the 2 minutes rest period. They were then asked to complete the Psychopathic Personality Inventory – Short Form (PPI-SF, Lilienfeld et al., 1996). Results show that the total PPI-SF score, in particular the affective factor of psychopathy, was negatively correlated with resting RSA and RSA reactivity during the contemplation of personal moral dilemmas. Findings suggest that individuals with psychopathic traits are characterized by emotion dysregulation during a moderately stressful task. To our knowledge, this is the first empirical study to demonstrate the significant associations between RSA hyporeactivity and psychopathic traits.

PSY – 40 BIASING MEMORY: THE EFFECT OF GENDER STEREOTYPES ON ASSOCIATIVE MEMORY FOR EMOTIONAL CONTENT

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There is a stereotype that women are more emotional than men. The aim of the present study was to determine the impact of negative gender stereotypes on memory. Memory is a good task to use because memory for emotional events is different from non-emotional events. Participants (n=29) were randomly selected into one of two conditions: some participants were exposed to the negative gender stereotype while others were not. All participants were tested using an associative memory paradigm using both emotional and neutral stimuli. Preliminary results of a 2 (condition: stereotype vs. no stereotype) x 2 (stimuli: emotional vs. neutral) mixed model ANOVA revealed an overall main effect for condition, such that that people exposed to the stereotype statements performed more poorly on associative memory tasks [$F(1, 27) = 5.01$, $p<.05$)], but no other main effects or interaction. Based on our hypotheses, we tested for differences by gender for types of stimuli. We found a marginally significant difference, such women (n=19) exposed to the stereotype performed more poorly with emotional stimuli [$t(17)= -1.55$, $p<.07$], but there was no significant difference for neutral stimuli [$t(17)= 1.06$, $p>.05$). Interestingly, men (n=10) showed a similar effect. Those exposed to the negative gender stereotype performed more poorly with emotional stimuli [$t(8) = -1.9$, $p<.05$)], but not with neutral stimuli [$t(8)= 1.25$, $p>.05$). These preliminary findings suggest that stereotype threat might affect associative memory with emotional content, and raises the possibility that the negativity of the stereotype may generalize beyond the target of the stereotype.

PSY – 41 BRAIN STIMULATION SHOWS THE ROLE OF THE PREFRONTAL CORTEX IN THE FEELING-OF-KNOWING

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When people fail to recall information, they sometimes have a feeling of knowing (FOK) that the currently non-recallable item is known and/or will be remembered on a subsequent recognition test. Functional magnetic resonance imaging (fMRI) studies have shown that activity in the prefrontal cortex (PFC) modulates with the subjective level of FOK expressed. Functional MRI is correlational and does not prove causality; therefore, the aim of this study was to test for a causal role of the PFC in FOK. Transcranial direct current stimulation (tDCS) was used, a non-invasive form of brain stimulation, to stimulate the PFC during a memory task. Participants studied 180 faces and names. Following study, they either received active prefrontal stimulation (1.5 mA for 10 minutes) or sham stimulation. This was a within subjects design and participants received active stimulation during one visit, and sham stimulation during the other visit. In a memory task, participants were then presented with the face and were asked to recall the name. Following recall, they made a FOK judgment and indicated on a scale of 1-6 whether they thought they would recognize the correct response. They were then asked to choose the correct name among three alternative names (1 correct, 2 incorrect).

Preliminary analyses showed that participants gave significantly lower FOK judgments for face-name pairs that were later correctly recognized during active compared to sham stimulation ($p<0.05$). These results demonstrate that directly manipulating prefrontal activity has a causal effect on the level of FOK expressed

PSY – 42 EXECUTIVE CONTROL AND MATHEMATICAL PROBLEM SOLVING: IS THERE A BILINGUAL ADVANTAGE?

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It has been suggested that bilingualism has beneficial effects on cognition because bilinguals have been found to outperform monolinguals on tasks requiring the use of executive control (i.e. inhibition, task-switching, monitoring, and selective attention). Although executive functions are also important for solving mathematical problems (Cirino, Morris, & Morris, 2002 & 2007), specific underlying processes have not been identified and the effects of bilingualism on mathematical ability have not been investigated. The present study compared the performance of bilingual and monolingual young adults (18-35) on various tasks of executive control (Letter-Number Sequencing and Digit-Symbol subtests from the WAIS-III, a Stroop task, and a Plus-Minus task) and mathematical problem solving skill (Calculation and Applied Problem subtests from the Woodcock Johnson III and a new Symbol Problems measure specifically developed for this study) to determine 1) whether bilingual advantage effects previously shown by children and older adults would also be found in young adults, 2) if the potential benefits of bilingualism extend beyond typical executive control tasks to a more applied domain like mathematical problem solving, and 3) identify the specific facets of executive function important for mathematical problem solving and that bilingualism may benefit . With a couple of exceptions, the results thus far have generally failed to show significant differences between bilinguals and monolinguals in any of the executive control and mathematical problem solving tasks. This lack of significant findings may be due to our relatively small sample of monolinguals and the heterogeneity of our participants compared to previous studies.

SCAS – 1 MULTIDIMENSIONAL VOICE DATA ON PARTICIPANTS WITH NORMAL VOICES FROM AGES 60-80: AN ACOUSTIC REFERENCE FOR THE ELDERLY POPULATION

Ashley Small and **Melissa Knudsen** (GRAD), Department of Speech Communication Arts and Sciences, CUNY Brooklyn

Purpose: The purpose of this study was to provide an acoustic reference (standard) from a population of participants (between the ages of 60 and 80) with perceptually normal voices. There is minimal acoustic voice data for this population. This investigation was designed to obtain normal reference values or standards from this older population against which acoustic data from a dysphonic (voice disordered) population of the same ages can be compared.
Method: The investigators tested 30 participants, between the ages of 60 and 80 (mean age, 69) with perceptually normal voices on the Multidimensional Voice Program (MDVP), an

acoustic instrument, by having them prolong the vowel /a/: The degree of jitter (instability of fundamental frequency in terms duration of vocal fold vibration) and shimmer (instability of amplitude in terms of lateral excursion of vocal fold vibration) were recorded. Additionally, the same procedure was performed on 30 participants between the ages of 18 and 40 for comparison with the older group.

Results and Conclusions: The results obtained on the t-test showed a significant difference in jitter and shimmer values between the two groups. Although the older group's voices were perceptually within normal limits, their acoustic data resulted in higher jitter and shimmer values as compared to the younger group. The literature indicates that older individuals often have "thinning vocal folds." It is, therefore, suggested that the physiological changes in the vocal folds of older individuals can appear in acoustic findings found in the present study. Since the present study's participants' voices were perceptually normal, their data can be used as a reference against which dysphonic voices can be compared.

BIO – 1 FEEDING BEHAVIORAL ANALYSIS OF NAUTILUS (*NAUTILUS POMPILIUS*)

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Chambered nautiluses are only found along deep (700m) coral reef slopes in the Indo-Pacific region, *i.e.* Australia and Fiji. Nautiluses are one of the oldest animal groups on this planet with a fossil record dating back to 500 million years. However, their extreme habitats have limited research into their natural behaviors. In this study, deep water video cameras were used to record the feeding behaviors of nautiluses attracted to a baited trap. The videos were analyzed and showed different nautiluses exhibiting similar behaviors regarding tentacle use and funnel movement. Based upon these observations, nautiluses appear to use specific tentacles for different tasks when searching for food. This behavior may be an adaptation to the deep, dark environment that nautiluses inhabit because it increases the likelihood of finding prey. This research is important because it provides key insights into the biology and behavior of a living fossil that is difficult to study. These data may also support future studies into climate change, as nautiloids have survived for millions of years and are sensitive to temperature change, they may be an important indicator species for climate change.

BIO – 2 HOW ARE ANTIBACTERIAL PLANT ESSENCES AND OILS ABLE TO PERFORM AGAINST E. COLI AND OTHER FOOD BORNE PATHOGENS?

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Contaminated food and water is an ever growing problem for developing countries worldwide. The lack of sanitary hygiene promotes bacterial growth and mutation spreading deadly diseases without accessible treatment. Infectious bacteria can easily be distinguished by their rapid growth, releasing toxins that damage the body and making the victim ill. A widely known food borne pathogen *Escherichia coli* thrives in the colon helping digestion. Bacterial infections from *E. coli* are very common in third world countries and are one of the leading causes of serious illness or death. The study of antibacterial properties of plants native or invasive to a country heavily affected with *E. coli* contamination has been practiced through decades of research Various plants were collected including Basil (*Ocimum basilicum L*.), Clove (*Syzygium aromaticum),* Oregano (*Origanum vulgare)*, Sage (*Salvia officinalis)*, Lemongrass (*Cymbopogon marginatus)*, Rosehips (*Rosa canina),* Catnip *(Nepeta cataria)* and composed into an overnight culture to compare qualitative data about their inhibition ability. Qualitative data was collected via co-culturing and quantitative with colony counts. The sample group of plants deemed effected for inhibition of *E. coli* growth (Chives, Basil, Rosehips, and Catnip) were plated three (3) times to show repeatability and range of effect and conclude if one result is the norm. Initial results showed slight reduction in bacterial growth for Chives and Rosehips.

BIO – 3 GENOMIC DETERMINATION OF BACTERIAL SPECIES THAT INHABIT AN ALGAL STRAIN

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With the growing concern to replace fossil fuels with biofuels, various studies investigate the use of microalgae for biofuel production. Algae have emerged as one of the most promising sources for biofuel production, and drastically differ from the current source of energy. Unlike fossil fuels, algae consume CO_2 and can be grown in fresh water, saltwater, and wastewater. They are virtually harmless to the environment and are reasonably inexpensive. Microalgae are very diverse unicellular photosynthetic organisms, and thousands of species exist. Microalgae species are all unique in production of**:** carotenoids, fatty acids and enzymes. To identify new potential platform strains, strains need to be properly isolated and screened. This determines the best strain growth as well as greatest yield of oil bodies (triacylglycerides.)
Out of thousands of newly isolated and screened strains, candidate strains are chosen for DNA extraction. The extracted DNA is sent out for DNA sequencing, and genomic information is retrieved. One of the best performing strains was *Scenedesmus Obliquus* DOE 0152. The strain was non-axenic and therefore, our extracted DNA included the DNA of the algal strain as well as DNA from various bacteria. Consequently, the DNA assemblies we received have shown to be of algal nuclear, plastid**,** mitochondrial and bacterial origin. Such information provided us with more insight regarding which bacteria were affiliated with the algal cells due to the diverse environment that the algae are collected from.
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BIO – 4 PREVALENCE OF METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS IN NEW YORK CITY MASS TRANSIT AUTHORITY SUBWAY SYSTEM

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Methicillin-Resistant *Staphylococcus aureus*, or MRSA, is a bacterium with beta-lactam antibiotic resistance and is of growing concern to both patients with compromised immune systems and healthy members of the community. Community-acquired MRSA, or CA-MRSA, has distinguished itself from its hospital-acquired counterpart (HA-MRSA) through an increased virulence in otherwise healthy individuals in contact with crowded spaces with contaminated surfaces. Though generally easier to treat, CA-MRSA emerged as a growing concern since the late 1990's and recent literature documents its increasing incidence rates. CA-MRSA has been isolated from many public facility fomites, including park equipment, school walls, and public transport systems. It is the aim of this study to discover the prevalence of CA-MRSA within the New York City MTA subway system, through methods of detecting its unique gene signature. After swabbing both train car and station surfaces, bacterial samples are isolated and the presence of CA-MRSA determined by using RT-PCR to

detect the presence of the mecA gene, which confers antibiotic resistance, the Panton-Valentine leukocidin (PVL) gene, which leads to its increased virulence, and the Luk-PV gene, which encodes for a biocomponent toxin that synergistically works with other toxins for increased virulence. Collections took place on the 2/5 and Q train lines, and are categorized by date and specific station. The 16S rRNA sequences of bacteria isolated from each collection were sequenced with Roche 454 Next Generation Sequencing up to genus classification, and it is the secondary aim of this research to examine the bacteria prevalent in the subway system.

BIO – 5 SEASONAL PLASTICITY OF DOPAMINERGIC INNERVATION OF THE AUDITORY THALAMUS IN THE PLAINFIN MIDSHIPMAN FISH

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The plainfin midshipman fish (*Porichthys notatus*) is a well-studied model to understand the neural and endocrine mechanisms underlying vocal-acoustic communication across vertebrates. In the summer mating season, males court females with an advertisement call to which a female will respond only when she is gravid (full of eggs). Furthermore, female hearing changes seasonally, driven by steroid hormones, in order to better encode the male's mate call. Catecholamines, including dopamine and noradrenaline, are thought to modulate the salience of and reinforce appropriate behavior to socially relevant stimuli. In this study we tested the hypothesis that catecholamine innervation of known auditory processing nuclei in the midshipman brain would be seasonally plastic. Brains were collected from gravid female midshipman in summer and non-reproductive females in winter, sectioned, and labeled by immunofluorescence (-ir) for tyrosine hydroxylase (TH), the rate-limiting enzyme in catecholamine synthesis. TH-ir fiber density and intensity was quantified in the midbrain torus semicircularis (TS) and the central posterior nucleus of the thalamus (CP). Also, the number of TH-ir neurons in the dopaminergic periventricular posterior tuberculum (TPp) was quantified as this nucleus is known to project to CP and other auditory centers as well as the ventral forebrain. Reproductive females showed significantly greater TH-ir fiber density and intensity in the CP. These results indicate that catecholamines may play a role in seasonal auditory plasticity and auditory-driven social behavior in midshipman and other vertebrates. Grant support: NIH SDA034996A

BIO – 6 BEHAVIORAL SYNDROMES IN FRESHWATER CRAYFISH (*PROCAMBARUS CLARKII)*

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It is well known that early experience shapes future behaviors, which change through ontogeny under the influences of developmental and environmental factors. A recent resurgence of interest in behavioral syndromes ('personality') among a range of vertebrate species has focused attention on correlated suites of behavioral traits that may remain stable across both development and environmental contexts. Behavioral syndromes have

been reported in a range of species and across various developmental stages, each giving some understanding to other mechanisms to evolution. Among invertebrates evidence for behavioral syndromes is somewhat scarce. Despite the large bodies of literature on social and behavior expressions among invertebrates, there are only a few published examples of syndrome-like behavior. Decapod crustaceans are a widely studied taxon for their stereotyped aggressive and exploratory behaviors, which are well characterized across contexts and ontogeny. We aim to explore what behavioral syndromes exist in laboratory-reared juvenile freshwater crayfish (*Procambarus clarkii)* in context to being exposed to novel environments. We test their exploratory, predator avoidance, and aggressive behaviors to define what the behavioral types "boldness" & "shyness" mean in regards to the animals in order to further examine their ecology and evolution. Our results show that animals from different broods do show correlated behaviors within their broods, with one brood being more bold (more exploratory & aggressive, don't care about predators), and the other being more shy (less exploratory & aggressive, do care about predators). Understanding these basic observations may allow for more exploration into behavioral syndromes in other specie populations.

BIO – 7 EVALUATING THE TOXICITY OF GOLD-BASED COMPOUNDS IN BACTERIA AND YEAST

Yaakov Hacker, Yozane Hokai, **Boruch Jurkowicz** (UN), Yolande S. Ramazani , Nur Zakirkhodjaev, Maria Contel and Theodore Muth. Departments of Biology and Chemistry, CUNY Brooklyn College, Brooklyn NY 11210.

Recently, gold-based compounds have attracted renewed interest as antimicrobial agents showing activity against an array of bacteria and parasitic microorganisms. Our group is testing the antimicrobial properties of new gold-based compounds synthesized by the Contel lab on a variety of Gram-negative and Gram-positive bacteria and on the yeast, *Saccharomyces cerevisiae*. The goal is to determine the efficacy and minimum inhibitory concentration of these compounds as well as to try and identify the cellular mechanisms targeted by these compounds. This is achieved through growth assays using wild-type and mutant strains in the presence of different concentrations of each compound. To date we have shown activity against Gram-positive bacteria, including clinically significant antibiotic resistant strains of *Staphylococcus aureus*, and yeast.

BIO – 8 DISCRIMINATION OF A. *VITIS* ISOLATES USING RT-PCR AND HIGH RESOLUTION MELT (HRM) CURVE ANALYSIS OF A CONSERVED TANDEM REPEAT REGION ON CHROMOSOME 1.

Rosio Fernandez, **Polina Ferd**, (UN) Aisha Dorta, Igor Britan, Danielle Lombardi, Theodore Muth, Department of Biology, CUNY – Brooklyn, NY 11210

High Resolution Melt (HRM) analysis is a process that can identify sequence differences in double stranded DNA (ds-DNA) by creating precise temperature ramping that will cause the

double helix of the ds-DNA to unwind and separate. Real-time polymerase chain reaction (rt-PCR) is a technique that allows the amplification of specific regions of the DNA through the use of primers. Both of these techniques will be applied to the bacterium, *Agrobacterium vitis*, that is known to cause crown gall disease in certain species of grape vines and in rare cases, it can cause opportunistic infections in immunocompromised individuals. In this study we hope to define if 17 isolates of *Agrobacterium vitis* can be differentiated on the basis of real-time PCR (rt-PCR) amplification followed by HRM curve analysis of a highly variable tandem repeat region (TRR) on chromosome 1.

BIO – 9 AN INTRASEXUAL MORPHOMETRIC ANALYSIS OF CATECHOLAMINE CELL GROUPS IN A VOCAL FISH SPECIES WITH ALTERNATIVE RERPODUCTIVE TACTICS

Zachary N. Ghahramani [1,3] (GRAD), Miky Timothy [1], Spencer Kim [1], Gurpreet Kaur [2], Paul M. Forlano [1,3,4], Department of [1]Biology; [2]Chemistry, CUNY Brooklyn College; The Graduate Center[3], CUNY; [4]Aquatic Research and Environmental Assessment Center, Brooklyn College

The plainfin midshipman, *Porichtys notatus*, is a seasonal breeding marine teleost that produces vocal signals for intraspecific communication. There are two distinct reproductive male morphs: Type I males are the territorial/nesting morph that vocally court females while type II males are the sneak-spawning morph that steal fertilizations from type I males (also incapable of courting females). Previously established sexual polymorphisms in the hindbrain vocal circuitry of midshipman are related to divergence of male reproductive tactics, explaining the discrepancy in vocalizing ability. Catecholamines, including the neurotransmitters dopamine and noradrenaline, are known regulators of reproduction and sexually motivated behaviors across vertebrates, including vocal-acoustic communication. We tested the hypothesis that there are intrasexual differences between the two males in the number of catecholaminergic neurons in four different nuclei and fiber innervation of the vocal motor nucleus (VMN). Animals were collected from nesting sites in Tomales Bay, CA during the summer nesting season. Subjects were sacrificed by transcardial perfusion and their brains were labeled for tyrosine hydroxylase (rate-limiting enzyme in catecholamine synthesis) by immunoflourescence. No differences were found in the number of TH-ir neurons within the four nuclei. However, type II males had a greater intensity and density of TH-ir fibers contacting somata in the VMN as well as specifically contacting vocal motoneurons. Our findings support the hypothesis that TH-ir dimorphisms in vocal pathways are substrates of behavioral divergence between the two types of male midshipman, indicating possible mechanisms of neural plasticity modulating social behavior.

BIO – 10 ANILINE BLUE ASSAY: A HIGH THROUGHPUT SCREEN FOR BETA GLUCAN EXPRESSING YEAST DELETION STRAINS

Alandra Mitchell (UN), Uthama Edupuganti, and Peter Lipke, Department of Biology, Brooklyn College, Brooklyn, NY 11210

Yeast such as *Saccharomyces cerevisiae* produces many benefits. It is the key ingredient in the production of bread, alcoholic beverages, biofuel and its cell wall components are known to increase athletic performance and boost the human immune system (Nelson 2012). The

yeast vegetative cell wall is made up of two layers (Osumi et al. 1998) that help maintain the cell integrity during growth, budding or conditions of stress. The components of these two layers exist in varying amounts and include glucans, mannoproteins, chitin, chitosan, cell wall glycoproteins and melanins. Glucans, the most structurally important components, are polysaccharide chains consisting of glucose units linked by glycosidic bonds (Cabib 2001). This study utilizes aniline blue to detect 1, 3 β-glucan per yeast cell. By testing a variety of glucans such as curdlan, laminarin, starch, cellulose and glycogen, we were able to confirm that only 1, 3 β-glucans bind to aniline blue. The 1, 3 β-glucans present on the yeast cell wall forms a fluorescent complex upon interaction with aniline blue fluorochromes. The fluorescence produced is measured by spectroscopy at an excitation wavelength of 400nm and emission of 502nm. We designed a high throughput 96 well microplate assay to screen an extensive list of yeast gene targets. The results show that the deletion of genes will up-regulate or down-regulate the expression of β-glucans. Our goal is to use this assay to screen mutants from a library of gene deletion strains, where we can identify the stains that show significant up-regulation of 1, 3 β-glucans.

BIO – 11 ENHANCED MICROSCOPY THROUGH HYBRIDIZATION OF PHOTOMICROGRAPHY AND FILM PHOTOGRAPHY

Mark Cheng-Ying Pan (UN) and Jürgen E.W. Polle, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY11210

This presentation is about the enhancement of microscopy photos through the hybridization of photomicrography and traditional dark room (film) photography. A photomicrograph is an image photographed through the use of microscope, but unlike traditional lab-based microscopy it incorporates aesthetic techniques used in photography. By combining the techniques used in traditional film photography and microscopy, the resulting hybrid is an enhanced, long-lasting archival print of a photomicrograph. Photomicrography is a relatively new form of art, but it allows both artist and scientist to better communicate with the general public. It provides a new form of tools for scientists to create great visuals. Whether it is for education or presentation, photomicrography facilitates a new potential for scientific communication.

BIO – 12 PRODUCTION OF MYCOBACTERIAL CELL WALL GLYCOPEPTIDOLIPIDS REQUIRES A MEMBER OF THE MBTH-LIKE PROTEIN FAMILY

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Glycopeptidolipids represent a class of free lipids found in the outer membrane of the mycobacterial cell wall. Many nontuberculous clinically relevant mycobacteria such as members of the *M. avium/M. intracellulare complex* produce GPLs. This finding suggests the potential role of this secondary metabolite in virulence. While many studies have been

devoted to reveal the roles of the genes involved in the GPL biosynthetic pathway, a complete understanding is still lacking. One of the MbtH-like protein-encoding genes of *M. smegmatis*, *msmeg_0399* (herein referred to as *gplH*), has been hypothesized but not conclusively determined to be required for GPL production. In this study, we conduct a mutational analysis and provide the appropriate complementation control necessary to designate *gplH* as an essential gene in the GPL biosynthetic pathway. This finding is supported by thin layer chromatography and mass spectrometry analyses (MS data not shown). The *gplH* mutant generated exhibits characteristic phenotypic properties of published GPL-deficient mutants as determined by congo red, biofilm formation and sliding motility assays. Our findings demonstrate a critical role of *gplH* in mycobacterial biology and advance our understanding of the genetic requirements for the biosynthesis of an important group of constituents of the mycobacterial outer membrane.

BIO – 13 TITLE: ROLE OF THE ACYL CARRIER PROTEIN DOMAIN OF THE POLYKETIDE SYNTHASE PPSA IN THE BIOSYNTHESIS OF MYCOBACTERIAL DIMYCOCEROSATE ESTERS

Julie Zeng (UN), Poornima Mohandas, Sivagami Sundaram Chavadi, Luis E.N. Quadri
Department of Biology

Pathogenic mycobacterial species, such as *M. tuberculosis* (*Mtb*) and *M. leprae* (*Mlep*) cause two of the world's oldest diseases, tuberculosis and leprosy, respectively. These diseases have not been eradicated due to the mycobacterium's innate resistance. Much of this resistance is attributed to the unique characteristics of the impermeable mycobacterial cell wall, which is a complex structure that has high lipid content. Two of the main lipids that contribute to its virulence and resistance are PDIMs and PGLs. The objective of this study is to investigate the role of the acyl carrier protein (ACP) domain of the polyketide synthase PpsA during PGL biosynthesis within the opportunistic pathogen *M. marinum (Mm).* The ACP domain has a highly conserved serine residue that is responsible for its function, therefore a *Mm* mutant in which the catalytically active serine is substituted with an alanine was generated. This mutant was analyzed by radiometric thin layer chromatography (radio-TLC) and found to be deficient in the production of both PDIMs and PGLs. Current studies involve complementation of the *Mm ppsA-ACP*$_{S\text{-}A}$ mutant.

BIO – 14 PHYLOGENY OF HAIRY CAP MOSSES AND THEIR EVOLUTIONARY SIGNIFICANCE

Jaquon C. Pipa (HS), BASE High School**,** Dr. Susan Pell, Kerry Barringer, Kobinah Abdul-Salim, Brooklyn Botanical Garden

Mosses are non-vascular plants that are usually found in moist, shaded areas. There are over 200 species of the class Polytrichopsida that are identified by their different photosynthetic structures in the top part of their leaves. We are trying to understand the evolutionary relationships in the class using DNA sequences of the chloroplast gene, rps4. We downloaded data from Genbank and generated sequences for two moss genera, Polytrichastrum and Polytrichum, to determine their phylogenetic position within the Polytrichopsida. Based on our analysis, we found agreement with the more conservative view of how the genus Polytrichum is defined, which includes portions that were previously

separated into a newer genus, Polytrichastrum. However, Polytrichastrum forms several separate lineages in the evolutionary tree, indicating that it is polyphyletic, and that its status as a genus should be reconsidered. This finding is important, as it provides an example of how molecular data can be used to help make decisions of how we define species.

BIO – 15 REGENERATION OF INTERNEUROMAST CELLS FOLLOWING LASER ABLATION IN ZEBRAFISH

Azka Javaid (HS), Hudspeth Lab at Rockefeller University, James Madison High School, Brooklyn, NY 11229

Hearing disorders, which affect almost ten percent of the world's population, are often caused by loss of hair cells in the inner ear following ototoxic or acoustic damage. In zebrafish, hair cells in the lateral line system regenerate compared to hair cells in human inner ear which do not regenerate following damage. Zebrafish lateral line is a structure composed of neuromasts which are group of cells deposited by a primordium. Hair cells within the neuromasts allow zebrafish to sense water currents and participate in schooling and other behaviors. The neuromasts are connected by a trail of interneuromast cells. In later fish development, interneuromast cells proliferate to produce intercalary neuromasts which then produce hair cells, illustrating a relationship between interneuromast cells and hair cell production. In zebrafish, the ET20 marker labels mantle and interneuromast cells, illustrating genetic
similarity between interneuromast and mantle cells. Therefore if hair cell regeneration is initiated by mantle cells, then interneuromast cells may also be involved in this process. Much is still not known about interneuromast cells and in order to research hair cell regeneration it is essential to understand interneuromast cell behavior. To study interneuromast cell regeneration, cells were laser ablated using a confocal microscope and imaged using a spinning disk microscope. Although full regeneration of interneuromast cells was not seen, extension and retraction of thread like filaments was observed. In the future, identifying genes involved in hair cell regeneration in zebrafish and then locating similar genes in humans could contribute to an understanding that could lead to decreasing hearing disorders.

BIO – 16 COMPARATIVE ANALYSIS OF *AGROBACTERIUM TUMEFACIENS* ADHESION TO *ARABIDOPSIS THALIANA* MUTANTS.

Amy N. Luckert, Chukwuebuka Udokwu, Thai Hua (UN), Anna Petrovicheva, and Theodore Muth, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

The transformation efficiency of the genes involved in *Agrobacterium tumefaciens* C58 are relatively well known but the attachment has not been studied in detail. In addition most studies have been done on the bacterial attachment factors while the plant ones have not been looked at closely. The efficiency of attachment of *A. tumefaciens* C58 to *Arabidopsis thaliana* wild-type, Columbia-0, and several mutants was examined. *A. thaliana* mutants were selected based on their association with the cell wall or homology to known

transformation mutants. Roots of the mutants were suspended in a solution of *Agrobacteria*, and the resulting attachment was analyzed by microscopy and compared to the wild-type. Several mutants displayed significantly higher or lower attachments than the wild-type. Using what we observed from the attachment of the mutants we can determine which plant genes are likely to be involved in the attachment process that is a precursor for crown gall disease.

BIO – 17 TESTING THE POTENTIAL OF EFFECTIVE MICROORGANISMS TO INHIBIT PATHOGENIC BACTERIA

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Effective microorganisms (EM) are a commercially available product used to reduce pathogens from compost and waste material to reduce smell and prevent disease spread. However, the action of the EM on compost has not been carefully studied. The aim of this investigation is to determine how well the Bokashi composting method uses EM to reduce pathogens. EM is a combination of naturally existing microbes, including lactic acid bacteria, yeast and phototropic bacteria. Compost samples were treated with EM and the presence of potentially pathogenic bacteria was tested for using selective media. Metagenomic sequencing data from the compost sample was used to identify bacteria. Profiling how well EM reduces specific types of pathogens will allow for new and more precise applications of EM in the prevention of disease spread and waste management.

BIO – 18 MOLECULAR ANALYSIS OF THE PARKINSON'S DISEASE IN THE DROSOPHILA

Godfred Talaga, **Ghada Alhabbab**, **Saboor Shaheed** (UN) and Qi He, Department of Biology, Brooklyn College of the City University of New York, 2900 Bedford Avenue, Brooklyn, NY 11210

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 – 19 INTERACTIONS BETWEEN BROMODOMAIN-CONTAINING PROTEIN 2 AND MURINE LEUKEMIA VIRUS INTEGRASE

Aleksandra M. Wudzinska, **Emily P. Callejo** (UN), Mustafa Ghanem, and Barbara Studamire, Department of Biology, Brooklyn College-City University of New York, Brooklyn, New York 11210

The viral integrase protein is necessary for stable integration of double-stranded viral cDNA into host genome, a step that is critical in the retrovirus life cycle. Previous studies have suggested that MoMLV integrase interacts with host cellular proteins, some of which may have a vital role in integration and in the selection of integration target sites. We are investigating a nuclear protein that binds to acetylated chromatin and is involved in transcription and gene expression. In this study, it is hypothesized that the host cellular protein interacts with MoMLV integrase to aid in its nuclear import and/or in its target site selection.

Our studies demonstrated a strong interaction between MoMLV integrase and this host cofactor in protein interaction trap assays. The level of MoMLV infection in mammalian cells decreased when expression of the host factor was reduced by RNA interference. These results suggest this host cofactor is necessary for viral infection.

Understanding how this kinase and chromatin-binding protein as well as other host proteins play a role in integration and infection via their interactions between MoMLV integrase may be crucial to improving the efficacy of gene therapy vectors.

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BIO – 20 THE IMPACT OF AQUATIC COPPER EXPOSURE ON VERTEBRATES AND INVERTEBRATES

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Copper is an essential nutrient in the metabolic processes of humans and other animals, which is toxic in excess. Copper can enter the aquatic system through natural sources (rock weathering), but the vast majority comes from anthropogenic sources (mining, waste disposal, run-off from pesticides). Exposure results in deleterious effects ranging from headaches to liver and kidney damage. Past studies indicate that invertebrates demonstrate a higher sensitivity to copper than vertebrates. In aquatic organisms, at levels too low to cause mortality, negative impacts on locomotion and olfactotion of food have been noted. The purpose of the current project was to identify the effect of environmentally relevant copper levels on an invertebrate, *Daphnia magna* (daphnia), and a vertebrate, *Carassius auratus* (goldfish), within the aquatic system. Daphnia were exposed to copper levels of 0.005-0.2 mg/L, and average locomotion and mortality were recorded. After 24 hours, there was complete mortality in all groups except the control, resulting in significance in both parameters measured. Goldfish were exposed to copper levels of 0.05-0.2 mg/L for two weeks, and video analysis captured the number of feeding attempts per fish per minute. Although feeding attempts were not impacted significantly by the increased copper levels, it was evident that the invertebrate demonstrated greater sensitivity to copper levels than the

vertebrate. Aquatic systems are exposed to copper contamination on a regular basis, so for the health of the organisms living in this environment and those who depend on them as a food source, copper levels should be monitored and controlled.

BIO – 21 HOMOLOGY MODELING AND MODEL EVALUATION OF NEK-FAMILY PROTEIN KINASES

Ruchama (Chaya) Steinberg, Nathan Morris, **Leonid Shoshin**, Anastasia Veresciac, Joseph Kabariti (UN), Shaneen Singh, Biology Department, Brooklyn College-CUNY NY, Brooklyn, NY 11210

Elucidation of protein structure can effect explanation of its activity, specificity and observed phenotypic behavior. Pending rigorous determination through spectroscopic analyses, homology modeling can provide usable structures that answer these questions to reasonable accuracy. Using secondary structure prediction, domain architecture programs and homology modeling software, catalytic domains of human Nek family kinases were modeled and evaluated; Nek kinases are NimA(Never in mitosis)-related protein kinases shown to be involved in cell cycle and whose mutations have been suggested to be related to cancer phenotypes. Best models were found to reconcile well with known biochemistry of Nek2 and homologous kinases.

BIO – 22 PRENATAL MATERNAL IMMUNE ACTIVATION DECREASES INHIBITORY SYNAPTIC CONNECTIVITY IN THE MEDIAL PREFRONTAL CORTEX

Kafi Friday [1] (UN), Sarah Canetta, PhD,[2] Christoph Kellendonk, PhD[2] *[1]City University of New York, Brooklyn College [2]Department of Pharmacology, Columbia University, College of Physicians and Surgeons*

Schizophrenia is a complex psychiatric disease whose underlying neurobiological origin is presumed to be both environmental and genetic. Prenatal exposure to infection appears to be particularly related to the development of cognitive deficits associated with the disease. Understanding the neurobiological changes underlying these cognitive impairments is critical as current therapeutics do not ameliorate cognitive symptoms. The overall goal of this project is to model prenatal infection, and subsequent maternal immune activation, in mice to gain insight into the contributing neurobiological changes. We have focused our studies on the development of a population of GABAergic neurons in the prefrontal cortex (PFC) that contain the marker parvalbumin (PV) that are believed to be critical for normal cognitive functioning, and found to be histologically abnormal in post-mortem tissue from adult patients with schizophrenia. We investigated whether prenatal exposure to infection also affects the ability of the PV+ neurons to form inhibitory connections onto pyramidal cells in the cortex. Inhibitory GABA-mediated currents were recorded in pyramidal cells and used as a measure of functional inhibitory connectivity. We found that both the amplitude and the frequency of these inhibitory currents were decreased in pyramidal cells in the PFC of adult offspring of prenatally-infected mothers. Therefore we conclude that prenatal exposure to infection decreases inhibitory synaptic connectivity in the PFC of adult offspring. As inhibition provided by PV+ neurons is believed to be critical for normal cognitive functioning,

these changes may represent a potential neurobiological mechanism underlying cognitive deficits associated with schizophrenia.
Supported by NIH NIGMS #GM008078.

BIO – 23 UNDERSTANDING THE ROLE OF *CANDIDA ALBICANS ALS5P IN C.ELEGANS OOGENESIS*

Alyssa Samlalsingh [1] (UN), Michael Bois [1,2], Peter N. Lipke [1,2] and Melissa C. Garcia [1,2]
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Candida albicans is an opportunistic pathogen that colonizes the nasopharyngeal and urogenital tracts of humans. It is the causative agent of many ailments ranging from superficial mucosal infections to life-threatening invasive candidiasis. In order to understand the pathogenicity of *C. albicans,* it is important to first understand the role of the adhesion proteins involved. Als5p is one of eight ALS adhesins present on the cell surface of *C. albicans*, which promotes cell aggregation, adhesion and amyloid formation. The amyloid forming sequence is critical in mediating this function, since a single amino acid substitution (V326N) can diminish these properties. In this study we used an Als5p expression model (*Saccharomyces cerevisiae*) and the model host *Caenorhabditis elegans* to study host response to an invading "pathogen". Our lab has previously demonstrated that the amyloid forming sequence of Als5p delays *S. cerevisiae* induced killing. This, together with previously published data suggesting an overlap between oogenesis pathways and immune responses, made us examine the effect of Als5p in oogenesis; we performed egg laying assays, in which the worms were fed *S. cerevisiae*, expressing Als5p, Als5p^{V326N}, empty vector (EV) or *Escherichia coli* strain OP50. The results showed that the average number of eggs laid by OP50 fed worms was 47.8 which is approximately three times the average, 14 eggs laid by the EV fed worms after feeding for a total of 48 hours. The data also showed an average of 99.4% viable offspring produced by worms fed OP50, which was two times the 46.7% of viable offspring from the EV fed worms after 72 hours. There was no significant difference between Als5p and Als5p^{V326N} fed worms. This data suggests that oogenesis is not amyloid dependent. It also suggests that the worms fed *S. cerevisiae* produce fewer viable offspring than those fed OP50. Due to the highly conserved genetic pathways in both *C. elegans* and humans, understanding the effects of Als5p in this model organism will help uncover the role of Als5p in commensalism and pathogenesis.
Supported by NIH R01GM 098616

BIO – 24 THE FUNCTION OF γδ T CELLS

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Immunoglobulin and T cell receptor (TCR) are principal elements regarding the evolution of immunology. One sub---population of T cells, the δ T cells, is a puzzle due to lack of knowledge on their function. A recent publication claims mutations occur in the TCR. Based

on the results of this experiment, these mutations occur in the adult nurse shark stomach more frequently than in the baby or adult thymus. This result proves mutations occur after encounter with antigen and δ T cells act as B cells to become receptors to antigen. This knowledge opens many doors for research in γδ T cells towards humans and vaccinations.

BIO – 25 CATECHOLAMINERGIC NEURONS ARE POTENTIAL TARGETS OF RAPID ESTROGEN SIGNALING IN A MALE MIDSHIPMAN FISH

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Midshipman fish, which produce sound for social communication, have the capacity to produce estrogen in the brain around vocal control centers, and acute injection of estradiol rapidly increases the vocal output of males which mimics natural variation in call duration. Since calling is a motivated social behavior, catecholaminergic neurons may play a role in modulating this behavior. Phosphorylated cyclic AMP response element binding protein (pCREB) is known to be activated by membrane-initiated estrogen signaling in the brain, including in catecholaminergic neurons. Therefore, we tested the hypothesis that catecholaminergic neurons in male midshipman were targets of rapid estrogen intracellular signaling via pCREB upregulation. We focused specifically on dopaminergic neurons in the periventricular posterior tuberculum (TPp) and the noradrenergic locus coeruleus (LC) as these nuclei are known to project to brain areas that control vocal-acoustic behavior. Males were either given injections of peanut oil (control) or peanut oil plus estradiol, sacrificed one hour later, and their brains removed, sectioned and double-labeled by immunofluorescence (-ir) for pCREB and tyrosine hydroxylase (TH)the rate-limiting enzyme in catecholamine synthesis. Results showed that on average, the control group had more TH+pCREB-ir neurons in the TPp than the estradiol-treated group, while the estradiol-treated group had more TH+pCREB-ir neurons in the LC. Overall, there were more pCREB-ir cells within the sampled areas in the control group than the treated group. Small sample size and large variance in hormone levels warrant further study to confirm catecholaminergic neurons as potential targets of rapid estrogen signaling in midshipman fish.

HNS – 1 FIT VS. FAT: IS BMI A MEANINGFUL MEASUREMENT IN STUDENT ATHLETES?

Jake Sutton (HS), Steven Kaye, Magen David Yeshiva HS

It has been shown that body mass index (BMI) is a misleading measurement for evaluating the body composition of athletes. The experimental population consists of 12 HS male basketball players who participate in two-hour training sessions 2x per week. The control population consists of 12 male students from the same school who are generally sedentary and participate in no formal exercise.
Physiologic measurements were performed including waist/hip circumference, height, weight and resting pulse (per minute). Based on this data, calculations were performed to determine body surface area, percent body fat and percent lean body mass. The Adiposity

Index (BAI) was also calculated for all members of the experimental and control groups. Following these calculations, an original measurement was developed consisting of body surface area (meters squared) divided by body mass (kg).
BMI has been identified by the N.I.H. to be the standard for evaluating body weight and obesity. Measurements of BMI performed using data from highly trained professional athletes such as Lebron James and Calvin Johnson indicates that while the BMI identifies them to be " obese", they are actually extremely fit due to their large muscle mass. Preliminary measurements suggest that using surface area divided by mass in conjunction with BMI can separate the fit from the fat and may reveal that the reported high levels of childhood and adolescent obesity may be flawed.

HNS – 2 DOES MUSIC AFFECT THE HEART RATE?

Henry Mbazbaz (HS), Steven Kaye, Magen David Yeshivah High School

Several articles have been published exploring the effects of music on heart rate. It has been hypothesized that the type of music one listens to, has an effect on the heart rate, either accelerating or slowing the pulse. (measured in beats per minute)
To test this hypothesis, a population of 10 high school students, ages 16-18 attending a private high school in Brooklyn NY were recruited .A control population consisted of students who were not exposed to the music.
Priyanka Chandrasekaran et. al. examined heart rate variability due to exposure to various genres of music, Erica Roth in her paper from LIVESTRONG.com stated " a person's heart rate changes while listening to music, but whether the heart beats faster or slower depends on the tempo of the music". To determine whether this holds true for adolescents of high school age, an experiment was developed.
Two distinct types of music were selected. A selection of quiet, calming "elevator music" Musak 1970's obtained online. The second selected music piece titled "Torrent" by Sidney and Garrix, containing a strong repetitive beat classified as "electro house". This music contains a loud repetitive beat.
To test this hypothesis, a methodology was developed consisting of pulse measurements and exposure to music. To eliminate distraction, the experimental subjects wore headphones to block extraneous background noise and blindfolds to eliminate visual stimuli. Prior to measurements each experimental subject was asked to sit quietly for 5 minutes with the headphones on and the blindfold in place. Following this 5 minute rest, 3 separate 30 second pulse counts were taken on the radial artery with no talking or unnecessary movement. The subject then experiences a wait of 2-3 minutes, sitting and "chilling" on the chair without movement or distraction. 5 minutes of calming "elevator music" were played and three 30 second pulse counts were performed. Following another 5 minute rest the same procedure was used playing 5 minutes of "Electro House" music and 3 additional 30 second pulse counts.
Following data collection, a table was constructed and statistical analysis was performed including mean and standard deviation. In addition, the BMI of each experimental subject was calculated and a correlation was performed to determine whether body size has an effect on heart rate response to music. Preliminary results suggest that while the pulse was

not accelerated by the strong repetitive beat of “electro house music”, the pulse dropped following the calming elevator music.

HNS – 3 CAN THE ECG DETECT DIFFERENCES IN THE MALE AND FEMALE ADOLESCENT HEART?

Isaac Shuster and **Jack Sardar** (HS)

It happens all the time, Doctors erroneously prescribing the wrong drug or the wrong dosage to their adolescent patients. Whether it be by accident or from lack of knowledge on the patient or the ailment being treated. It’s an extremely hazardous situation when this happens, there is a wide array of outcomes that can stem from this mistake, ranging from stomach pain to nausea, and of course, DEATH. The doctor ends up having a lawsuit filed against him when all that he was doing was following his medical training. But, this can get confusing. The female heart and the male heart are different.
A review of the literature on the male and female heart, substantiated my hypothesis that there are physical differences in the adolescent male and female heart. G.P. Whyte, K.George, S.Sharma, et –al, stated “ the genetic differences that exists in the adaptive response of the heart to physical training and the causes of sudden cardiac death in young athletes indicate the need for population-specific normal value”
“Eighteen(5.8%) male athletes presented with a left ventricular internal diameter during diastole(LVIDd)>60mm, with an upper limit of 65 mm. Of the 136 female athletes, none were found to have a maximum wall thickness>11 mm. Left ventricular internal diameter was<60mm in all female athletes.”
Sanjay Sharma, MD; Barry J Maron, MD; Greg Whyte, stated that “Systematic sports training may cause increased left ventricular wall thickness creating uncertainty regarding the differential diagnosis of athletes heart from hypertrophic cardiomyopathy (HCM). The distinction is crucial because HCM is responsible for about one-third of all sudden deaths in all athletes. Echocardiographic data defining athletes are limited largely to adults, with little information specifically in adolescent athletes…for whom the risk of HCM is highest.

HNS – 4 THE EFFECT OF PHYSICAL TRAINING ON HIGH SCHOOL BASKETBALL PLAYERS.

Joseph Levy (HS), Magen David Yeshivah High School, Brooklyn, NY. 11214

There has been a major discussion of childhood obesity and its related risk factors. Among the risks associated with large body mass are diabetes and high blood pressure. In addition it has been documented that the standard measurement of BMI is misleading in athletes and people with large muscle mass.
An experiment has been designed to explore the relationship between body size and blood pressure in adolescent male’s base on their degree of physical training. Experimental subjects were selected from a high school basketball team. a control population of non-athletic sedentary students were also selected. The students range in age from 15 to 17. The student athletes undergo a training regimen three times per week consisting of 25 pushups and crunches followed by 25 minutes of sprints and short intense runs. The work out is

followed by basketball drills and 30 minutes of active play. The sedentary students were questioned concerning their activity and engaged in no regular physical exercise.
It has been hypothesized that students from this team who following this training regimen for a minimum of four month have experienced physiologic changes that could be observed through determination of body surface area, lean body weight, estimate of adiposity and resting blood pressure/ pulse.
Spreadsheets will be prepared and calculations will be performed to determine the mean of each population and standard deviation and the average BMI of the experimental and control groups. It is anticipated that students who engage in physical training will have a lower pulse and blood pressure resulting from development of an athletic enlarged left ventricle. It is also hypothesized that this training would be sufficient to show reduced body fat and a lower BMI. If this hypothesis proved to be correct it will substantiate that physical activity could help reverse childhood obesity in students who are willing to become more active.

ENV – 1 FACTORS AFFECTING THE QUANTITY AND QUALITY OF STORMWATER RUNOFF AROUND THE ACADEMY OF URBAN PLANNING CAMPUS, BUSHWICK, NY.

Miguel Ruiz, Candace Boston, Chris Viquez, **Kathy Puma**(HS), Donovan Chavez, Engerlina Pichardo and Ashanti Bailey, Academy of Urban Planning

In urban areas, run-off water from rainstorms can cause flooding, sewage overflows, and pollution of local waterbodies. This issue was investigated by conducting a stormwater survey of the Academy of Urban Planning (AUP) campus, which drains to Newtown Creek, a listed Superfund site. Mapping techniques, spatial calculations, and laboratory procedures were used to determine how the types of surfaces and pollutant sources around the school contributed to run-off water quality. Results showed that over 60% of the school campus was impervious, which would lead to nearly 200,000 gal. of run-off water during a typical storm (based on the NY state stormwater design manual). One of the main pollutants associated with stormwater around the campus was loose leaves and dirt, which were found to contribute nutrients to runoff water. After analyzing the data opportunities for best management practices such as rain gardens, rain barrels, and litter control were identified around the AUP campus.

ENV – 2 CAN MUDBALLS CONTAINING EFFECTIVE MICROBES IMPROVE WATER QUALITY?

Jenny Ng and **Solomon Chan** (HS), Midwood High School Intel Science Research Program, Brooklyn, NY 11210; **Priscilla Deng** (HS), Edward Murrow High School Intel Science Research Program, Brooklyn, NY 11238; Annie Hauck, Department of Health and Nutrition Sciences, Brooklyn College -CUNY, Brooklyn, NY 11210; Zhongqi (Joshua) Cheng, Department of Earth and Environmental Sciences, Brooklyn College-CUNY, Brooklyn, NY 11210

Algae covered urban ponds are common scenes during warm seasons worldwide. The growth of algae at the pond surface further enhances the reducing and low pH environment at the pond bottom, which promotes the release of nutrients from the sediment to the water column. This pilot study investigates whether mudballs containing effective microbes can be used to reduce eutrophication. The hypothesis is that beneficial bacteria in the mudball will be released gradually and change (or dominate?) the microbial systems at the pond bottom. Microbial meditated processes that release nutrients from the sediment could thus be suppressed. Three parallel experiments were conducted at the Poly Prep High School in Brooklyn. First, one of the two ponds was treated with hundreds of mudballs containing bran inoculated with EM-1 (TeraGanix Inc.), while the other neighboring pond was untreated as control. Time series pH and turbidity of the pond water were recorded, in addition to color. Second, such comparison was conducted in two shallow troughs filled with pond water – one treated with a mudball and the other untreated. In both the pond and trough experiments, an initial increase of turbidity was observed during the first several weeks after the mudball treatment, but after that the treated water becomes much clearer than the untreated water. Third, seven buckets with pond water was subject to different treatments (i.e., with or without mudball, lime, sediment). Water turbidity and color differences in these buckets clearly suggested that biogeochemical processes were modified by the addition of EM-containing mudballs.

ENV – 3 IMPROVING SOIL QUALITY USING FERMENTED FOOD WASTE

Nicholas Lee (HS), Midwood High School Intel Research Program, Brooklyn, NY 11210; Vandra Thorburn, Vokashi Kitchen Waste Solutions, Brooklyn, NY 11238; Zhongqi (Joshua) Cheng, Department of Earth and Environmental Sciences, Brooklyn College-CUNY, Brooklyn, NY 11210

Food waste constitutes about 15% of the solid waste in the United States. Currently the majority of food waste is mixed with other garbage and transported to landfill. The degradation of organic waste produces methane, a green house gas 20 times more effective than CO2. Food waste contains abundant nutrients that could potentially be used as a valuable resource to improve urban soil quality. In this study, food scrapes were first fermented for two weeks with wheat bran that had been inoculated with effective microorganisms (EM-1). EM-1 was used to speed up the degradation process and eliminate the odor and pathogen issues that are commonly found during the food waste composting process. The fermented food waste was then mixed with dredged sediments (almost all sand) and either saw dust or yard waste to make composts. Bucket experiments were conducted at the Marine Park Golf Course in Brooklyn, to determine the best ratio of sediment: food scrapes: saw dust/yard waste. The finished compost all contained high organic content and nutrient levels. However, the pH of the compost was noticeably lower than the original sediment due to the formation of lactic acid, a byproduct of the fermentation process. A sediment-FW-YW ratio of 1:3:1 was found to be the ideal mix for making the best compost.

ENV – 4 EVIDENCE FOR GLACIAL REBOUND AT GERRITSEN CREEK

Elliot Shrem (HS), Magen David Yeshivah, Brooklyn New York 11214

Hurricane Sandy with its strong storm surge had a drastic impact on the shoreline of New York City and Long Island. Several weeks after the storm, a walk along the shoreline of Gerritsen Creek revealed three distinct lines of seashells, embedded into an earthen cliff about 1.5 meters above mean high tide sea level.

A closer examination of the shells forming these three layers, or strata, revealed that they consisted primarily of broken clam and oyster shells with some fully intact shells. Photographs document the shells and these sediment layers.

Within the cliff appeared uniform sized, dark colored sand-like sediments which may be of glacial outwash origin. Both to the right and left of this exposure, the soil appeared to be landfill material.

It has been hypothesized that this may be a deposit which dates back to the end of ice ages. The location of these shell layers approximately 1.5 meters above sea layer suggests that it may be evidence of glacial rebound. Sediment tests are now underway to determine whether this is glacial sediment.

ENV – 5 NOISE POLLUTION IN THE NEW YORK CITY SUBWAY SYSTEM

Melissa Cetout, **Bianca Lazare, Shaniqua Norville**, and **James Datis** (HS), It Takes a Village Academy, Brooklyn, NY

Many New Yorkers take the NYC subway on a daily basis, often several hours at a time. Although riding the train can contribute to lower car emissions, riders are exposed to high levels of noise as they commute. This study was conducted to try and determine if the noise pollution in the NYC subway system is high enough to cause permanent hearing loss. Noise level meters were used to determine the noise levels throughout the 2 and 5 train lines through Brooklyn and Manhattan, as well as in the Atlantic Avenue Station. By tracking the noise levels, the amount of noise as well as the duration of exposure can be measured. Results show both the 5 and 2 lines experience noise levels that are safe. The 5 lines is louder than the 2 line for a longer period of time. The Atlantic Avenue station comes close to presenting harmful noise levels, but does not enough to cause permanent hearing loss. However, thing such as headphones or railway construction have not been taken into account for this study and could potentially increase the noise level and in turn raise the risk of permanent hearing loss. Frequent subway riders may want to consider taking the 5 line over the 2 line, as it presents a smaller risk of permanent hearing loss.
Supported by GK-12 "City as Lab" NSF-DGE 0638718

ENV – 6 COMPARING THE BALANCE OF CO_2 THROUGHOUT NEW YORK CITY: SEQUESTRATION VS EMISSION

Jamal Thompson, **Louise Nadia** , **Cassandre Celus** , **Cassandra Hyppolite** (HS), It Takes a Village Academy, Brooklyn, NY

A study was conducted to determine if different parts of New York City suffer from excessive CO_2 emissions by calculating how much CO_2 gets emitted by cars versus how much gets sequestered by trees in 4 different areas throughout Brooklyn and Manhattan. The four selected areas are Times Square and the Financial District in Manhattan, as well as the area surrounding ITAVA in East Flatbush, and an area adjacent to Prospect Park in Crown Heights. In each area, 4-6 blocks were selected. Circumference and apparent height of trees was measured in each area. Cars were separated into 5 categories based on mileage, and each type of car was counted as they passed each block included in the area. In Brooklyn, both areas have enough trees to more than make up for the amount being emitted by the cars. However, in Times Square, there is 4 times more CO_2 being emitted than can be sequestered by the trees, and in the Financial district, there are no trees, and therefore there is no sequestration. Other sources of CO_2 such as energy production, idling cars and different traffic patterns were not taken into account, and would most likely add a significant amount of CO_2 being emitted. Our results suggest more trees should be planted in Manhattan to make up for the excessive amounts of CO_2 being emitted by cars
Supported by GK-12 "City as Lab" NSF-DGE 0638718

ENV – 7 APPLICATION OF POLLEN ANALYSIS TO UNDERSTAND HOLOCENE CLIMATIC AND LANDSCAPE CHANGES IN WESTERN SERBIA

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Application of pollen analysis on ancient sediments is considered to be a robust proxy for reconstructing past ecological and climatic changes. In this study, we present some initial findings for understanding Holocene ecological changes in southeastern Europe using pollen analysis. In 2012, a sediment core was extracted from a sinkhole near Donja Sipulja, western Serbia, using a Livingston corer. The sediment core was sampled at 10 cm intervals and standardized chemical techniques were used to isolate the pollens for microscopic identification and quantitative analysis. For this study, we examined distinct pollen assemblages from three depths; the surface (0 cm), 50 cm, and 100 cm in order to understand how the pollen patterns change over time. Pollen assemblages can indicate how climate changes, for example a region becoming drier or wetter. Preliminary results from this study demonstrate the presence of temperate indigenous tree and herbaceous species, along with key cultivated plant species. Pollen percentage diagrams from this analysis will be presented to exhibit how vegetation has changed in this region and how humans have potentially impacted the landscape. These preliminary results will eventually be merged with future pollen data and radiocarbon dates from the region, which will shed light onto past climatic changes during the late Holocene, the last 5000 years.

ENV – 8 CARBON DIOXIDE AND THE HEALTH OF OUR BROWNSVILLE NEIGHBORHOOD

Brandon Clarke, **Kayeef Kelly**, **Ashley Melendez**, **Kamilah Nur** (HS), Anthony Buchanan, Macardo Henry**,** Kurdeen Joseph, Ja'leel Loadholt**,** Joshua Lovelace, Melissa Williams, Malik Fleming and the students of Ms. Springer's 9th grade Living Environment Regents class, and Ms. Parker's 8th grade Earth Science Regents classes, Teachers Preparatory School, Brooklyn NY 11212

The GK-12 science research class of Teachers Preparatory School in Brownsville focused on research related to global warming. It is important for the community to know if there are enough trees in the neighborhood to compensate for CO_2 emissions of cars and people. To test this hypothesis, the carbon footprints of cars and the sequestration of CO_2 of trees in the neighborhood were calculated and compared. An approximate three-block radius around Teachers Preparatory School was chosen as the study area with about 140 trees measured. The total CO_2 sequestration of the trees was compared to CO_2 emissions created by population density and local traffic. The cars in the study area emit different levels of CO_2 each day into the air. By using clickers a variety of vehicles were counted at specific locations and times within the 4-block radius. The carbon footprint was then calculated for each car type and combined into one total value. The carbon footprint of population density was determined from the 2010 census. Overall, it was found that the number of trees in the

neighborhood do not compensate for the carbon footprint resulting from people and cars. To lower the carbon footprint people can walk, carpool, bike, or take the bus when possible.
Supported by GK-12 "City as Lab" NSF-DGE 0638718

ENV – 9 CHARACTERIZATION OF CYANOBACTERIA BLOOM FACTORS ON TOXICITY IN PROSPECT PARK LAKE

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Prospect Park Lake is a shallow lake in a recreational park in Brooklyn, NY that is subjected to nutrient loading from NYC's tap water and precipitation run-off. Cyanobacteria bloom appear every summer, resulting in increases in chlorophyll a concentration and toxicity levels. The effects that the bloom has on its quantum efficiency are unknown. In this research, chlorophyll a, microcystin, and quantum efficiency were measured to assess a possible correlation among the three. Chlorophyll a concentration was measured using an overnight soak extraction and fluorescence measurement. Quantum efficiency was measured in a dark adapted state in a Satlantic Fluorescence Induction and Relaxation (FIRe) system. Microcystin was measure using a microcystin- ADDA immunoassay toxicity kit that measures all types of microcystin and nodularians. Samples were taken at the main lake once a week for 8 weeks. Results suggest an inverse relationship between chlorophyll a and quantum efficiency and a weak positive correlation between quantum efficiency and microcystin concentration. However, both trends have no statistical significance therefore are inconclusive without more data. The goal of the experiment is to determine further conditions that causes greater secretions of microcystins by observing the inner system of the cyanobacteria when affected by overgrowth. The significance in this research is to further understand cyanobacteria for future risk assessments.

ENV – 10 THE SEASONAL VARIABILITY OF DIATOM BLOOMS IN JAMAICA BAY

Detbra Rosales, Jane Hauptman (GRAD) and Dr. John Marra
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Diatom blooms occur during the progression of winter to spring in Jamaica Bay. Water samples were collected and observed from January 2013 to April 2013 to follow the progression of species within the blooms. *Thalassiosira aestivalis* was the first dominating species of diatom, followed by *Asterionella* sp. and *Chaetoceros* sp. in late March. By early April the diatom blooms ceased and very few species were detected. Chlorophyll-A analysis, Fv/Fm and temperature readings were utilized to assess the progression of the bloom and microscopy was used to determine the dominating species. Monitoring the progression of diatom blooms may provide insight for future ecological classification in Jamaica Bay as well as offer a link between species and trophic structure dynamics and nutrient uptake.

PHYSICS – 1 THE EFFECT OF TEMPERATURE VARIATION ON IONIC CONDUCTIVITY AS IT RELATES TO FUEL CELLS

Meriam Sahin (UN), Y.Adam, A. Blake, L. Moussignac, J. Peet, Brooklyn College, Department of Physics, Mentor: Dr. Sophia N. Suarez, Physics, Brooklyn College

The effects of temperature variation on ionic conductivity can influence the usage and improvement of clean energy sources such as fuel cells. Ionic conductivity is the measurement of a material's charge transport ability. Measurements of ionic conductivity can indicate how well a material carries an electric current. Ionic conductivity measurements were taken from electrochemical cells that were assembled with silver electrodes immersed in the solutions of interest. To the two electrodes an alternating electric current (AC) was applied and the resulting voltage was measured at different temperatures. The solutions of interest were vanadium solutions and ionic liquids. It was observed that ionic conductivity tended to increase with increasing temperatures. It was also observed that higher vanadium concentration leads to lower solution ionic conductivity. This is important for the vanadium redox flow battery which relies on $VOSO_4/H_2SO_4$ solutions of varying concentration to store the electrical energy.
Sponsored by: National Science Foundation – Louis Stokes Alliance for Minority Participation

PHYSICS – 2 WATER DROPLET AND MENISCI PROFILES: A COMPARISON STUDY BETWEEN MACROSCOPIC THERMODYNAMIC PREDICTIONS AND RESULTS FROM NANOSCOPIC COMPUTER SIMULATIONS

Nicolas Giovambattista, **Shaina Reisman** (UN), Department of Physics, Brooklyn College-CUNY, Brooklyn, NY 11210

We perform molecular dynamics (MD) simulations of (A) nanoscale water menisci expanding between two parallel surfaces and (B) nanoscale water droplets in contact with a surface. A range of surfaces is considered, from hydrophobic to hydrophilic. In the case of macroscopic droplets and menisci, the properties of these systems, such as the shape of the corresponding liquid-vapor interface, can be computed from macroscopic thermodynamics using concepts such as contact angle and surface tension. In this work, we test how *macroscopic* thermodynamics predictions compare with the results obtained from our *nanoscale* MD.

PHYSICS – 3 SUSTAINABILITY THROUGH THE EYES OF THE FERMI PARADOX

Aisha Margarita Dorta (UN), Micha Tomkiewicz. Department of Physics, CUNY – Brooklyn College. Brooklyn, NY 11210

The Fermi paradox is a contradiction between the high probability intelligent civilizations exist and the lack of evidence found. There are many aspects that can be examined in reference to this paradox but the connection between the majorities of cases is that the intelligent civilization requires interstellar travel. The goal of this experiment is to examine the necessary components to sustain the human civilization so they can acquire space travel.

This work will attempt to use the only civilization that we know, ours, in order to identify the absolute level of sustainability in order to resolve the Fermi paradox. In order to produce a definition for sustainability, we must examine a multitude of subjects that attribute to sustainability and its relationship with the Fermi paradox.
Our research indicates that major concerns include energy consumption and its effect on the environment as well as fresh water supply and food supply. Global energy consumption trends show an increase over the next century and freshwater demands increasing by over 200% by 2025 which will then affect the amount of water appropriated for food i.e agicuture, livestock. In furthering these studies, we can come to understand what is required for a sustainable civilization. With the inclusion of other aspects of sustainability for example modern medicine, technology, etc. the definition of absolute sustainability can be refined.
Supported by NIH/NIGMS MARC GM008078

PHYSICS – 4 PYRITE AND ITS ROLE IN THE IRON-SULFUR WORLD THEORY

Yao Jiang (HS) and Tiffany Loi, and Mim Lal Nakarmi, Brooklyn College-CUNY

The iron sulfur world theory, proposed by Günter Wächtershäuser, is related to the reactions of several volcanic gases with pyrite as a catalyst. The volcanic gases reacted under oceans in hydrothermal vents at high temperature and pressure. However, oxygen is also proposed by him as an anti-theory. The volcanic gases included carbon dioxide, carbon monoxide, hydrogen sulfide, and hydrogen cyanide. Wächtershäuser believed that oxygen was not available in the early atmosphere so it wasn't part of his theory. In order to verify his anti-theory, we used a sample of pyrite and put it under the chemical vapor deposition with oxygen. We did this 5 times at multiples of 100 degrees Celsius. Then we took SEM images to see what was happening to the pyrite. The results supported Wächtershäuser's anti-theory because oxygen corroded the pyrite and which then would not allow it to act as a catalyst. We also used glycine to react with pyrite using argon as a carrier gas. We used glycine because our professor said the volcanic gases were too dangerous. We put glycine and pyrite together in the CVD from 100 to 300 degrees Celcius. Then we took SEM images. The results supported Wächtershäuser's theory because glycine cohered with the pyrite. These results shed light on our not yet known origin.

CIS – 1 SYSTEM DESIGN FOR COORDINATED SWARMING VIA COMMUNICATION AND NAVIGATION USING LEGO NXT MINDSTORMS ROBOTS

Maksym Stetsyuk (UN) and Theodore Raphan (Faculty Advisor), Department of Computer Science, Brooklyn College-CUNY, Brooklyn, NY 11210

The goal of this project is to develop a swarm of intelligent agents using LEGO NXT Mindstorms to efficiently complete given tasks. This goal was achieved by developing a communication system and designing a sonar-based navigation system for multiple agents. The communication system utilizes the Bluetooth API and object-oriented message routing for message deliveries to agents via the host PC. The swarm control system on the host PC is scalable due to multithreading. Low- and high-level communication systems for multiple

agents were developed and tested. The navigation system is based on the ultrasound beacons approach that has several components: 1) It utilizes an Arduino Mini microcontroller that was attached to the NXT robot
and is responsible for receiving pulse data from the beacons and transmitting it serially to the NXT Brick. 2) A transmitter interface was developed, which manages four ultrasound beacons with Piezo-electric transducers and a RF antenna for synchronization of ultrasound pulses. 3) A receiver interface was developed, which is attached to the robot, receives and processes the RF and ultrasound pulses. 4) Algorithms based on mathematical techniques were implemented to transform the robot's position based on the received data in the arena to the position coordinates in the XY plane. Thus, we have developed a NXT Lego Mindstorms platform for studying intelligent swarming behavior. The future work will include hardware modifications in order to make accurate positioning of robots more stable. The research and development of swarming algorithms will also be considered in the future.

CIS – 2 AN ANALYSIS OF ACCIDENTS IN HEALTHCARE - THE THERAC AND PANAMA CASES

Bustamante Brathwaite, **Eranga Gamage** (GRAD), and Karunya Rajagopalan, Department of Computer and Information Science, Brooklyn College-CUNY

Technology and Systems are now integral to the Healthcare domain. Rapid developments have indeed increased the complexity of health care systems. Computers systems are widely used in healthcare for diagnostic support, patient treatment, patient identification, asset tracking etc. However unanticipated interactions of these complex systems can cause normal accidents. [1]
The fundamental essence of this case revolves around two well-known accidents that occurred with the use of software within radiation therapy. The Therac-25 machine overdosed cancer patients and caused fatal injuries in the USA and Canada. This infamous case has garnered much attention to the need for proper systems engineering and user monitoring. However 15 years later as with the case of the Instituto Oncologico Nacional of Panama, the development and use of such complex systems in Healthcare can still trigger the same tragic result where 17 patients died due to over dosage. Not only does this case explore the events of both events, it also highlights the underlying reasons.
The primary insights of this case is that even with the advancement of technology and the public documentation of accidents that occur in the past as with the Therac-25, the probability of even worse future accidents happening in the same domain is still relatively high. Recognizing the need to correct these underlying reasons within the critical domain of Healthcare makes this case very relevant as we further develop complex systems and systems engineering practices in this area.

CIS – 3 CLUSTERING TANDEM REPEATS VIA TRINUCLEOTIDES

Dina Sokol and **Sarah Ita Levitan** (UN), Department of Computer Science, Brooklyn College-CUNY, Brooklyn, NY 11210

A *tandem repeat* in DNA is two or more contiguous, *approximate* copies of a pattern of nucleotides, e.g. *CGGCGGC*. Tandem repeats in DNA sequences are important in biological

phenomena and diagnostic tools, and they are used for disease diagnosis, mapping studies, and human identity testing. Computational tools that identify these tandem repeats generate large volumes of data which are often difficult to decipher without further organization. We describe a new method for post-processing tandem repeats through clustering and classification.
Our work presents a clustering scheme to group similar tandem repeats together, using the n-gram model to summarize the sequence of a tandem repeat. Analysis of the clusters for the tandem repeats in the human genome shows that the method yields a well-defined grouping in which similarity among repeats is apparent. Our new, alignment-free method facilitates the analysis of the myriad of tandem repeats that occur in the human genome and we believe that this work will lead to new discoveries on the roles, origins, and significance of tandem repeats.

CIS – 4 A COMPARISON OF AUCTION-BASED APPROACHES TO ROBOT ROUTING

Ofear Balas (UN)[1], A. Tuna Özgelen [2], Dayton Clark [1], Simon Parsons [1,2] and Elizabeth Sklar [1,2,],[1]Dept of Computer & Information Science, Brooklyn College, The City University of New York, 2900 Bedford Avenue, Brooklyn, NY 11210, [2]Dept of Computer Science, The Graduate Center, City University of New York, 365 Fifth Avenue, New York, NY 10016

One of the many problems of multi-robot coordination is task allocation. In and of itself, the problem of allocating a set of resources can be quite daunting. Attempting to find an optimal solution involves solving not one, but two hard problems: (1) for a set of tasks, finding a set partition that will give an optimal solution; and (2) for a set of tasks, finding an order which will give the shortest path between the tasks. The first problem is a fairly straightforward set partition problem, while the latter is a Traveling Salesman Problem, where the shortest path to visit each task in the set must be found. Instead of attempting to solve for optimality, which is extremely expensive, this research looks at market-based approaches to approximate reasonable answers to these sorts of problems. By auctioning off tasks to the "highest" (or lowest) bidder, a reasonable distribution of tasks amongst robots can be approximated.
Funding for the work described here has been provided by the National Science Foundation under grants #CNS-0851901, #CNS-1156827 and #IIS-1116843.

CIS – 5 REACTIVE RESPONSE TO HIGH-VOLUME OF RANGE DATA FOR AUTONOMOUS ROBOT NAVIGATION

Vitaliy Matiyash (UN)[1], J. Pablo Munoz [2], Dayton Clark [3], Simon Parsons [2,3] and Elizabeth Sklar [2,3],[1]Hunter College, [2]The Graduate Center, [3]Brooklyn College

While autonomous robot navigation often relies on a combination of both visual and range data from the sensors, the former is not always available, especially in a dark or smokey environment. The goal of this research study is to develop a robust algorithm that will allow an autonomous robot to gather a high volume of range data from the scene, process

it on-the-fly, and execute motion commands in order to navigate the environment without any collisions. The experimental setup includes an iRoomba Create robot and Microsoft Kinect, which is used as a range sensor that allows multiple depth images of a scene to be captured every second. The sensor is connected to a laptop which is mounted on top of the robot. The laptop does all the processing and gives all the motion commands to the robot. The algorithm developed allows saving all the depth information from the sensor to be analyzed in future, or to discard it and do all the processing and decision making in real time. The sensor's horizontal field of view of 57 degrees allows taking into the account the information about front, left and right walls in the direction of robot's heading. The algorithm detects the floor and the area in which the motion can be done without any collisions, and "votes" for the best angle that the robot should move.
Funding for the work described here has been provided by the National Science Foundation under grants #CNS-0851901 and #CNS-1156827.

CIS – 6 APPLYING THE FORR COGNITIVE ARCHITECTURE TO ROBOT NAVIGATION

Slavisa Djukic (UN)[1], Susan L. Epstein [1,2], Dayton Clark [3], Simon Parsons [2,3] and Elizabeth Sklar [2,3],[1]Hunter College, The City University of New York, [2]The Graduate Center, City University of New York, [3]Brooklyn College

This project explores the idea of implementing a FORR-based ("For the Right Reasons") cognitive architecture to the problem of robot navigation within a maze. FORR was partially implemented in a simulated environment in this work, which demonstrates the problem-solving capabilities of "advisors" that help the robot navigate. A series of problems were presented to the robot, and the success of each advisor at solving these problems was measured with respect to several metrics: the proximity of the robot's target location to an obstacle in its path, the size of the obstacle, and the shape of the obstacle. These preliminary experiments show that the simple advisors implemented demonstrate acceptable problem-solving capabilities for certain simple problem configurations. For more complicated configurations, a full implementation of the FORR architecture would be required.
Funding for the work described here has been provided by the National Science Foundation under grants #CNS-0851901, #CNS-1156827, #IIS-1116843 and #IIS-1117000

CIS – 7 COMPARING TWO ALGORITHMS FOR IDENTIFYING ROBOTS

Mithlesh Dev (UN)[1], J. Pablo Munoz [2], Dayton Clark [3], Simon Parsons [2,3] and Elizabeth Sklar [2,3],[1]City College, [2]The Graduate Center, CUNY, [3]Brooklyn College

One of the many problems of multi-robot coordination is task allocation. In and of itself, the problem of allocating a set of resources can be quite daunting. Attempting to find an optimal solution involves solving not one, but two hard problems: (1) for a set of tasks, finding a set partition that will give an optimal solution; and (2) for a set of tasks, finding

an order which will give the shortest path between the tasks. The first problem is a fairly straightforward set partition problem, while the latter is a Traveling Salesman Problem, where the shortest path to visit each task in the set must be found. Instead of attempting to solve for optimality, which is extremely expensive, this research looks at market-based approaches to approximate reasonable answers to these sorts of problems. By auctioning off tasks to the "highest" (or lowest) bidder, a reasonable distribution of tasks amongst robots can be approximated.

Funding for the work described here has been provided by the National Science Foundation under grants #CNS-0851901, #CNS-1156827 and #IIS-1116843

CIS – 8 DEVELOPING A THEORY FOR PROBLEM SOLVING: COLLECTING, CLASSIFYING AND STUDYING CLASSIC PROBLEMS

Shweta R. Shetty (GRAD), Danny Kopec, Department of Computer and Information Science, Brooklyn College

Critical thinking is essential for problem solving and having a theory for approaching complex problems would help students use technology as a tool to apply problem solving strategies and not just as a source of solutions to problems. The goal of this study is to develop a theory for problem solving by applying various techniques like problem reduction, solving sub-goals, backtracking, recursion, etc. to understand, represent and solve complex problems according to problem types. Four classic problems in areas such as mathematics, computer science and artificial intelligence will be used for the study. The solutions to these problems will be analyzed with respect to the problem solving techniques and strategies used as well the form of representation used to present the solution to determine the best strategies according to problem types. Problem solving behaviors of humans will also be studied in experimentation by analyzing the human solutions to determine the techniques used to approach the problems. The inferences drawn will be used to support development of a theory which can be helpful in creating algorithms and programs for solving problems.

MATH – 1 REGIME STRATEGIES AGAINST OPPOSITION GROUPS: A MATHEMATICAL ANALYSIS

Emmanuel Ekwedike (UN) and Jeff Suzuki, Mathematics Department, Brooklyn College

Our study involves social dynamics, specifically the interaction between the regime and opposition groups. The model of our study consists of a general system of linear ordinary differential equations with coefficient parameters. This model represents complex phenomena as a set of equations described in simplified terms. The parameters of the equation denote major changes that can occur to the phenomena according to its prestige. In particular, our quantitative dynamic models show that, under suitable assumptions, a regime can avoid the radicalization of opposition groups.

Supported by NYC LSAMP-PROGRAM

ENG – 1 CAN WE DETERMINE THE CAUSE OF THE COLLAPSE OF THE I-35 BRIDGE BY TESTING COMPLETE ARCHES?

Mateen Yousaf (HS), Math Academy, James Madison High School, Brooklyn, NY 11229

The goal of the experiment was to see if the design flaws of the original 1-35W bridge in Minneapolis, Minnesota caused it to collapse. The procedure that were taken to prove the flaws of the old design was by creating one model of the trusses of the bridge with straight arches, and a new, improved and modified design of the trusses where the arches are fully completed. Then by having trials I put weights on both models to see which arch could withstand more weight. The data that was collected from the 1-35W Bridge are its inspection history, background analysis of the bridge, and how structurally deficient the bridge was over time. Moreover, the U.S. Department of Transportation and Federal Highway Administration did not restrict access or close the bridge when inspections in the past had stated that the bridges gusset plates which held beams together creating a truss that were unstable. Nothing in the inspection reports indicated that inspectors found the need to restrict access to the bridge. To conclude, the original design failed compared to the new modified design, and because of the flaws of the trusses serving as arches, it was unable to withstand as much weight. Therefore, if the bridge did have full or complete arches it would not have fallen. Supported By: National Transportation Saftey Board

ENG – 2 BALLOON TUNNEL FLOOD PROTECTION

Yehonatan Hadar (HS), Magen David Yeshiva H.S.

Twenty years ago in Chicago, a small leak in an unused freight tunnel expanded beneath the Windy City and started a flood which eventually gushed through the entire tunnel system. Hurricane Sandy was one of the costliest catastrophes in the history of New York City, this was the first recent episode of subway tunnel flooding, at an estimated 71 billion dollars in damages to the city. The city was underprepared for this hurricane, and thus so were the subway and highway tunnels, subways and highway tunnels were flooded and remained out of service for many weeks, because it was flooded with ten feet of water.

Experiments were performed using balloons in large diameter plastic pipeto simulate an anti-flood device. The initial test proved that a temporary water filled plug would be effective in blocking the flow of water into the simulated tunnel. The balloon took the shape of objects placed in the tunnel and was effective seal blocking most water. Additional experiments determined the pressure needed to withstand floods of various sizes.

CHEM – 1 COMPUTED DESIGN OF A PEGYLATED PHOTOSENSITIZER DRUG FOR THE KILLING OF OVARIAN CANCER CELLS.

Benjamin Rudshteyn (UN), Rajib Choudhury, Inna Abramova, Goutam Ghosh, Ashwini Ghogare, Dorota Bartusik, and Alexander Greer, Department of Chemistry, Brooklyn College-CUNY, Brooklyn, NY 11210

As part of a project to develop potent ovarian phototherapeutic agents, we report on computed conformations of a chlorophyll derivative (chlorin e_6) modified by three short poly(ethylene glycol) chains [$CH_3(OCH_2CH_2)_3OH$]. Lowest energy MM+ conformations were taken and re-optimized with B3LYP/6-31G(d) in the gas phase and show some curling of the PEG groups onto the porphyrin ring. We found many curled PEG conformers to be slightly lower in energy than uncurled conformers. Li et al. observed curling of an attached PEG onto a hematoporphyrin ring using solution-phase molecular dynamics simulations, and "curling" of long fatty acid chains is directly related to dynamics in phospholipid membranes (Sawyer et al.). Computed octanol/water log *P* values were obtained with the ACD algorithm, which has performed well in predicting the log *P* values of drugs. We find the computed log *P* value of chlorin e_6 to decrease by about 2 orders of magnitude as the number of attached PEG groups increased from 0 to 3. We are currently computing whether the PEG groups can also form a cage around cations associated with cell function, such as potassium ion and lysine residues. The PEG groups clearly introduce steric hindrance to the sites in which they are bound. Because aggregation can reduce photosensitization efficiency, such as the reduced excited-state lifetimes, *tris*-PEGylation of the chlorin photosensitizer is proposed to better ensure maintenance of a monomeric state for enhanced photodynamic killing of ovarian cancer cells.

Supported by National Institute of General Medical Sciences of the NIH.

CHEM – 2 A THERMODYNAMIC MODEL FOR THE BEHAVIOR OF ELECTROLYTES CONFINED IN CHARGED LIPID MEMBRANES

Mark Kobrak and **Kunle Babatunde** (UN), Department of Chemistry, Brooklyn College-CUNY, Brooklyn, NY 11210

Lipid Bilayers made in the form of spherical vesicles are called liposomes, which vary in size from 25 nm to 1 µm. Liposomes have many important medical and research applications, and also serve as models for cells and organelles, which are bounded by lipid membranes. We study the behavior of solutions confined in liposomes using a recently developed thermodynamic model. The model shows that, under certain conditions, the ionic strength of a confined electrolyte will be different than that of a macroscopic reservoir to which it is coupled. We model the properties of vesicles to determine whether such an effect could be important in understanding the behavior of liposomes and cells.

CHEM – 3 THE EFFECT OF LOW DOSE LEAD EXPOSURE ON CORTICAL BONE MINERAL PROPERTIES OF YOUNG C57/BL6 FEMALE MICE

Syeda Thamina Rasool (HS), Midwood High School. Supervised by Chase Budell and Terry Dowd, Department of Chemistry, Brooklyn College-CUNY, Brooklyn, NY 11210

Lead is an environmental toxin that can cause a range of health effects especially for developing children under the age of six, even at low levels. Elevated lead levels are still found in older/urban housing in the U.S. A study of women 65−87 years old showed a positive correlation between high blood lead levels (BLL) and incidence of hip fracture. My study helps us understand more about how bone properties work along with bone strength. Newborn female mice were given 250 ppm of lead acetate in their drinking water until they were eighteen weeks old. The effects of lead on their cortical bone were analyzed with the Fourier Transform Infrared Microscopy (FTIRM) after they were sacrificed. Measurements of mineral quality and its amount were looked at along with collagen quality. Increased rates of bone turnover were found due to lead. This would have the effect of liberating any mineral−bound lead into circulation and weaken bone tissues. Low bone density is a symptom of osteoporosis. Lead may somehow be exerting a direct or indirect effect on osteoblast and osteoclast activity.

CHEM – 4 STUDIES ON THE MECHANISM OF ACTION OF RUTHENIUM-CLOTRIMAZOLE COMPLEXES EFFECTIVE AGAINST LEISMANIASIS AND CHAGAS DISEASE

Cyril Abraham (UN), Alberto Martínez, Flavia Barragan and Roberto A. Sánchez-Delgado, Department of Chemistry, CUNY Brooklyn College, Brooklyn, NY 11210

Leishmaniasis and Chagas disease are endemic in tropical regions and caused by trypanosomatid parasites. These diseases affect 12 million and 20 million people, respectively. While some treatments are available, they are outdated and resistant strains have emerged. Our long-term object is to develop new metal-based treatment options. Our group synthesized a series of ruthenium-clotrimazole (CTZ) complexes effective against Leishmania major and Trypanosoma cruzi, the causative agents of these diseases. Ru(p-cymene)Cl2(CTZ) in particular is very active in vitro against the parasites and non-toxic to human cells. In order to improve this drug, it is important to understand its mechanism of action. Our hypothesis is that CTZ dissociates from the complex to act as a sterol biosynthesis inhibitor inside the parasite, while the remaining metal fragment binds to DNA. We are testing this hypothesis by studying the behavior of the drug in solution. The pH is varied to match that of various environments outside and inside the cell. Also, the interactions of the drug with cysteine and guanine derivatives are investigated by NMR spectroscopy as models of DNA binding. We specifically aim to determine whether CTZ dissociates from the compound under these conditions; these studies will provide insight into how the drug acts on the trypanosomatids

CHEM – 5 THE REACTION OF HYPERFORIN WITH SINGLET OXYGEN

Inna Abramova (GRAD), Benjamin Rudshteyn, Dorota Bartusik and Alexander Greer
Department of Chemistry, Brooklyn College-CUNY, Brooklyn, NY 11210

The major chemical constituents of Hypericum Perforatum including flavonoids (rutin, quercetin) naphtodianthrones (hypericin, pseudohypericin) and phloroglucinols (hyperforin, adhyperforin) open new perspectives in search of naturally derived compounds for singlet oxygen ($^1O_2$) chemistry. Hypericin having a large chromophore system is under research as a photosensitizer agent in photodynamic therapy. Alternatively, we hypothesize that hyperforin is capable of generating singlet oxygen by chemical means via the Russell mechanism. The first step involves the allylic oxidation of an alkene with an allylic hydrogen (the ene) with molecular oxygen (the enophile) yielding a substituted alkene with the double bond shifted to the allylic position. The ene reaction can proceed either through a concerted pathway producing hydroperoxides or through a stepwise radical mechanism if the concerted mechanism is geometrically unfavorable. Eight monohydroperoxide hyperforin isomers, 24 dihydroperoxides isomers, 32 trihydroperoxide isomers and 16 tetrahydroperoxide isomers are possible as the result of ene reaction. The product from the ene reacton with an alpha hydrogen can undergo Russell reaction where the alpha hydrogen determines which group becomes the ketone. Therefore, we hypothesize that if two hydroperoxide groups in the hyperforin molecule can get close enough to react, the singlet oxygen can be generated. The aim of this study is to use the computational analysis to predict the likelihood of the reaction of hyperforin involving singlet oxygen.

CHEM – 6 COMPETITION MINI-DIALYSIS ASSAY TO DETERMINE BINDING SELECTIVITY OF PORPHYRINS TO G-QUADRUPLEXED DNA.

Martha B. Dua-Awereh (UN) and Lesley Davenport, Department of Chemistry, Brooklyn College

Telomeric G-quadruplexes are guanine-rich sequences that form stacked G-tetrads stabilized by the presence of a cation. Telomeric G-quadruplexed DNA has been shown to inhibit telomerase activity, an enzyme linked to 85% of cancers. Thus G-quadruplexes provide a potential target for drug binding and delivery. Porphyrins can promote or stabilize the formation of the DNA quadruplexes. The aim of this study is to design a micro-competition dialysis assay to evaluate the binding selectivity of a range of porphyrins for quadruplexed DNA *versus* duplex DNA, using a sodium/phosphate buffer control solution. A 1µM solution of the test porphyrin was prepared to evaluate the micro-competition binding assay method. The binding selectivity of the test porphyrin to 75µM of calf thymus DNA (duplex DNA) or 75µM of quadruplexed DNA samples was evaluated by dialysis using a Pierce Biotechnologies 0.1 mL Slide-A-Lyzer Mini Dialysis device (50 - 100uL volumes). After stirring for 24 hours, the concentrations of porphyrin bound to the dialyzed DNA samples were determined using UV spectrophotometry. We tested five metallo-porphyrins: N-methyl mesoporphyrin IX (NMM), Cobalt (III) Mesoporphyrin IX, Chromium (III) Mesoporphyrin IX, Manganese (III) Mesoporphyrin IX, and Zinc (II) Mesoporphyrin IX. Our results indicate and confirm previous reports of the selective binding preference of NMM for quadruplex DNA

over duplex DNA. Binding studies using the metallo-porphyrins will also be discussed. The results also indicate that the Slide-A-Lyzer Mini Dialysis device is an effective tool for determining binding selectivity of small molecules to micromole concentrations of quadruplexed DNA.
Supported by NIH/NIGMS MARC GM008078 and NIH 5SC3 GM095437-01.

CHEM – 7 FLUORESCENCE STUDIES OF SOLVENT EFFECTS ARISING FROM MOLECULAR CROWDING.

Aaron Hope (UN), Yasemin Kopkalli and Lesley Davenport, Department of Chemistry, Brooklyn College of CUNY, Brooklyn, New York 11210

Relatively high concentrations of biomolecules within cells are able to exist under highly crowded conditions in their functional conformation. Molecular crowding within a biological cell can be replicated *in vitro* by addition of synthetic polar crowding agent PEG 200. The aim of this study is to examine the effects of this crowding agent on solution conditions, including polarity and viscosity and to quantify these effects. We have used the fluorescent polarity sensitive dye 1-anilino-8-napthalene sulfonate (ANS) as a probe of its local environment resulting from addition of increasing PEG 200 concentrations in buffer. Surprisingly, with increasing additions of PEG 200, a short-wavelength ('blue') Stokes shift coupled with an enhanced fluorescence intensity is observed from the fluorescence emission spectrum (wavelength *versus* intensity) of ANS. While similar effects have been observed for ANS in apolar solvents of lower dielectric constant, PEG 200 is a polar compound. Thus the observed enhanced fluorescence intensity and wavelength shifts appear to arise from the increased viscosity with addition of PEG 200 rather than from polarity effects. These observed fluorescence effects for ANS provide a useful application as a spectroscopic tool for assessing the extent of crowding for both *in vitro* and *in vivo* studies.
Supported by 5SC3 GM 095437-03.

CHEM – 8 NOVEL CATALYSTS FOR HYDROGENATION AND DEHYDROGENATION BASED ON METALLIC NANOCLUSTERS SUPPORTED ON FUNCTIONALIZED NANOCARBON

Peretz Gutnick [a,b] (UN), Minfeng Fang,[a] Reena Rahi,[a] M. Vittadello,[b] Roberto A. Sánchez-Delgado, [a], [a]Department of Chemistry, Brooklyn College and [b]Department of Physical, Environmental and Computer Sciences , Medgar Evers College, CUNY

Fossil fuels currently provide over 80% of all the energy consumed in the US and will continue to dominate in 2030. Current legislation imposes severe limits on the amounts of aromatics, S and N in fuels, which are difficult to achieve with current refining technologies. Catalytic hydrogenation plays an important role in de-aromatization reactions and as a key step in hydrodesulfurization (***HDS***) and hydrodenitrogenation (***HDN***) processes, but conventional catalysts require drastic conditions and/or are easily poisoned. We have discovered efficient catalysts based on supported metal nanoparticles for the hydrogenation of a variety of aromatic and N-heteroaromatic compounds.
An important alternative energy resource is hydrogen, which could be obtained from water using solar energy. A key issue that needs to be addressed in fostering a hydrogen economy

is storage of large amounts of what is a flammable gas. One interesting approach may be the use of organic liquids like N-heterocycles as hydrogen storage materials, because the existing infrastructure for liquid fuels could be employed. Coupled catalytic hydrogenation and dehydrogenation reactions can provide a way for storing hydrogen in liquids; we are developing new catalytic materials composed of metallic nanoparticles supported on carbon nanotubes for that purpose.

CHEM – 9 NEW ANTI-MALARIAL AGENTS TARGETTING PLASMODIUM FALCIPARUM DIHYDROOROTATE DEHYDROGENASE (PFDHODH).

Jesus G. Estrada (GRAD) and Roberto A. Sánchez-Delgado,, Brooklyn College

Combating drug resistance is a prevailing issue in the fight against malaria, a tropical disease caused by the *Plasmodium* parasite. Our long term goal is to develop new therapeutic agents against resistant malaria. The specific aims of this project are to design and synthesize new molecules capable of targeting the *Plasmodium falciparum* dihydroorotate dehydrogenase (PfDHODH), a protein whose job is crucial to the pyrimidine metabolism.
Using computational methods we docked compounds on protein surfaces obtained from crystal structures. These methods allowed us to calculate binding energies, analyze protein-ligand complexes, and predict hydrogen bonds and hydrophobic interactions. Using a known inhibitor as a template we have designed two series of compounds that incorporate chloroquinoline, a known anti-malarial drug, and lipophilic aromatic groups containing substituents capable of hydrogen bonding to the protein. These two fragments are connected via a triazole moiety built by the use of click chemistry. A number of new compounds have been selected for synthesis on the basis of their high binding energy to the protein, as compared to the known inhibitor, and their adequate chemical properties following Lapinski's rules. The first members of the series have been synthesized and characterized. Once the synthetic work is completed, we will analyze their ability to inhibit PfDHODH using spectrophotometric techniques. The most promising compounds will be sent to specialized labs for anti-malarial evaluation.

INDEX

**The names of main authors are underlined*

LEGEND:

BIO – Biology
CHEM – Chemistry
CIS – Computer Science
ENG - Engineering
ENV – Earth and Environmental Science
HNS – Health and Nutrition Science
MATH – Mathematics
PHYSICS
PSY – Psychology
SCAS – Speech Communication & Arts Sciences