

Science Research Day

May 13, 2011

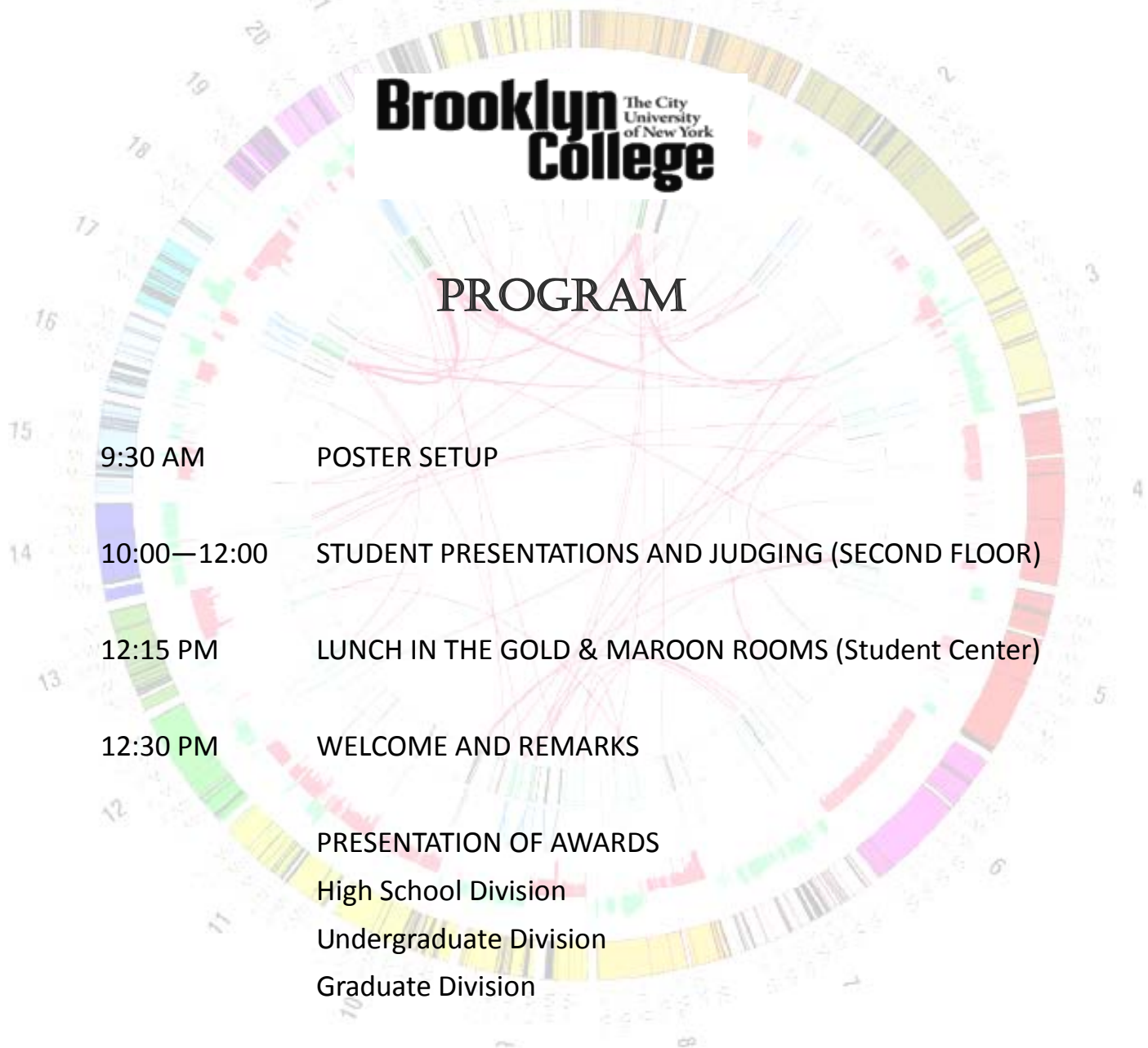
ABSTRACT BOOK

Sponsored by
Dean of Research and Graduate Studies
NIH RISE, MARC, CSTEP & STEP Programs
Office of Student Life
GK-12 "City as Lab"

21ST ANNUAL BROOKLYN COLLEGE SCIENCE DAY



PROGRAM



9:30 AM

POSTER SETUP

10:00—12:00

STUDENT PRESENTATIONS AND JUDGING (SECOND FLOOR)

12:15 PM

LUNCH IN THE GOLD & MAROON ROOMS (Student Center)

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 COGNITIVE BEHAVIORAL THERAPY FOR ADOLESCENTS WITH CROHN'S DISEASE AND COMORBID ANXIETY DISORDER: IMPLICATIONS FOR DISEASE ACTIVITY, PAIN AND PHYSICAL SYMPTOMS.

Claire J. Hoogendoorn (GRAD), Alexis M. Briggie, Melissa V. Auerbach, Sarah J. Kahn, Laura C. Reigada

Comorbid anxiety in youth with Crohn's disease, a chronic autoimmune disorder, is common and has the potential to exacerbate physical symptoms and medical management. Further, somatic symptoms related to undiagnosed anxiety can become intertwined with disease symptoms, and can further complicate medical treatment. As cognitive-behavioral therapies (CBT) have shown efficacy in treating anxiety disorders in children, this study aims to assess the efficacy of disease-specific anxiety interventions in youth with Crohn's. Seven children ages 11 to 17 ($M=14.28$) with Crohn's Disease and comorbid anxiety participated in a 12-session CBT program. Youth were recruited and treated in a tertiary medical clinic. Dependent-sample t-tests were used to examine pre- to post-treatment outcomes. Findings demonstrate a reduction in anxiety symptoms based on self-report ($p<.05$) and a semi structure interview ($p<.01$). Child self-report of current pain was significantly reduced ($p<.05$). While not statistically significant, gastrointestinal ($M_{pre}=10.29$, $M_{post}=8.86$, $p=.533$) as well as non-gastrointestinal ($M_{pre}=5.86$, $M_{post}=4.43$, $p=.118$) symptoms decreased pre- to post- treatment. Lastly, disease activity scores, completed by their physician, suggests symptom improvement ($p=.064$), with four out of seven children reducing their activity classification (severe, mild, or inactive). Results provide preliminary support that CBT may reduce anxiety and physical symptom in youth with Crohn's disease. While the study is limited with a small sample size, results have potential implications for anxiety (disease-specific and general) and functioning in youth with a chronic illness.

PSY – 2 DOES ANTI-ATHEIST PREJUDICE PROTECT PARENTAL RELATIONSHIPS?

Michael W. Magee (GRAD), Curtis D. Hardin, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

Anti-atheist prejudice in the U.S. is socially accepted and rife—and not just because most Americans are religious. This research suggests that hostility toward atheists is related in part to protecting parental relationships: When religious people interact with atheists, their automatic, unconscious attitudes toward atheists become more positive or more negative depending on the quality of their parental relationships.

Because religious beliefs are normally established within the context of parental relationships, and because research shows that religious beliefs are defended to the extent parental relationships are perceived to be vital, we reasoned that anti-atheist prejudice might also be animated by parental attachment. From this perspective, negative feelings religious people have about atheists are a consequence of love and loyalty to their parents.

Religious participants completed a measure of anti-atheist prejudice in the presence of an experimenter who casually mentioned that he was an atheist (or did not). Participants indicated as quickly and accurately as possible whether the word 'good' or the word 'bad' had been presented on the computer screen, unaware that half of the presentations were imperceptibly preceded by the word *atheist*. Prejudice is indicated by the degree to which people respond faster to the word *bad* than the word *good* in the trials preceded by the word *atheist*.

Interacting with an atheist reduced anti-atheist prejudice among those with low parental attachment but, if anything, increased anti-atheist prejudice among those who with high parental attachment. Results were replicated in another experiment that manipulated parental attachment with an essay task.

PSY – 3 THE EFFECT OF DORSAL HIPPOCAMPAL LESIONS ON ACQUISITION OF CONDITIONAL CONTROL BY TEMPORAL CUES IN A FEATURE POSITIVE OCCASION-SETTING TASK

Rifka C. Derman (UN), Vinn Campese, Andrew Delamater, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

Previous studies have shown that simple Pavlovian learning can be brought under conditional control by temporal stimuli (Bouton & Hendrix 2011). Other research has suggested that the hippocampus may play a role in the development of conditional control by temporal cues (Campese & Delamater, 2010). In one experiment, we studied the role of the dorsal hippocampus (DH) in the acquisition of conditional control by temporal cues in a feature positive occasion-setting task. Long Evans rats received either neurotoxic lesions of the DH or control surgeries. After recovery, the subjects then underwent training in a Pavlovian learning task in which the offset of a 10-sec auditory conditioned stimulus (e.g., a tone) was reinforced with two food pellets when it followed a 16-min intertrial interval (ITI), but not when it followed a 4-min ITI. Preliminary results suggest that the DH lesions may slightly impair the acquisition of this discrimination compared to control subjects.

PSY – 4 THE EFFECTS OF GOSSIP ON SELF-PERCEPTION AND THE PERCEPTION OF OTHERS

Joseph Kabariti (HS), Mr. Stuart Benas and Mr. Steven Kaye, Magen David Yeshivah High School in Brooklyn, New York

This project investigated the effects of gossip on self-perception and the perception of others. Questionnaires were completed by forty teenagers at Magen David Yeshivah High School in Brooklyn, New York. Magen David is a private high school, which consists of approximately six hundred students belonging to the Syrian Jewish community in Brooklyn. The hypothesis "Teenagers educated about gossip that encounter positive gossip from strangers will have his/her self-perception and perception of others affected positively" was supported by the data. The hypotheses "Teenagers educated about gossip who encounter negative gossip from strangers will have his/her self-perception and perception of others affected negatively" "Teenagers educated about gossip who encounter positive gossip from friends will have his/her self-perception and perception of others affected more positively than when they encounter positive gossip from a stranger" and "Teenagers educated about gossip who encounter negative gossip from friends will have his/her self-perception and perception of others affected more negatively than when they encounter negative gossip from a stranger" were not supported by the data.

PSY – 5 ARE THERE HEMISPHERIC DIFFERENCES IN GENERATING LITERAL VERSUS FIGURATIVE MEANINGS?

Isabel V. Rodriguez (UN), Rita El-Haddad, & Natalie A. Kacinik, Department of Psychology, Brooklyn College and the Graduate Center, City University of New York

There are indications that the right hemisphere (RH) is preferentially involved in processing figurative language (e.g., Anaki et al., 1998; Klepousniotou & Baum, 2005; Schmidt et al., 2007), but many studies have failed to find evidence of this preferential RH involvement (e.g., Coulson & Van Petten, 2007; Kacinik & Chiarello, 2007; Rapp et al., 2004). In normal, non brain-injured, participants the vast majority of this research has investigated the processing of figurative expressions, particularly the activation and integration of their meaning, using comprehension paradigms. The present study used visual half-field presentation and a word generation procedure to examine hemispheric differences in the generation and production of literally versus figuratively related nouns in response to adjectives with a literal and figurative sense. The typically robust processing advantage for words presented to the right visual field left hemisphere (RVF/LH) was not obtained, in accordance with previous work by Chiarello et al. (2006) suggesting that the RH may be important for generating and maintaining the activation of potential word responses. However, in contrast to our expectations, but in accordance with previous work by Kacinik and colleagues (Kacinik & Chiarello, 2007; Kacinik et al., 2008) participants were NOT more likely to generate figuratively related words in response to stimuli in the LVF/RH and literal responses in the RVF/LH. These findings thus provide further evidence that the RH does not seem to be preferentially involved in either the comprehension or generation and production of figurative meanings.

PSY – 6 FEELING MOVED BY ART? FEAR, NOT PHYSIOLOGICAL AROUSAL, INCREASES, SUBLIME FEELINGS ABOUT ABSTRACT ART

Thomas McAusland (UN), Kendall J. Eskine, Natalie A. Kacinik, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

In the field of art criticism, E. H. Gombrich (1960) argued that art is perceived in a top-down manner, specifically that appreciating art is a higher-order cognition that draws from one's beliefs, concepts, and experiences. However, nearly a century earlier, Edmund Burke (1756) argued that the sublime feeling- that is, the phenomenological experience of pure astonishment- is rooted in feelings of fear and terror. Taking an empirical stance, he suggested that basic sensory experiences shape many forms of judgments and that states of fear, in particular, inhibit reason and help evoke sublime feelings. But fear is not an isolated state; it naturally co-occurs with physiological arousal. In this vein, James' theory of emotion (1884) posits that emotional states are caused by physiological arousal. Fear would only be experienced phenomenally as an emotion *subsequent* to heightened heart palpitations, muscle tension, etc. Therefore, it is unclear whether fear or physiological arousal evokes sublime feelings. The present study tested the effects of fear and physiological arousal on participants' sublime feelings as they rated abstract art. Results show that while physiological arousal is positively correlated with higher sublime ratings, fear elicits the strongest sublime experience. These findings provide support for the role of affect in aesthetic judgment.

PSY – 7 IDIOMATIC REPRESENTATIONS: CAN LIVE BODIES WAKE UP DEAD METAPHORS?

Benjamin Cooley (UN), Tom McAusland, Kendall J. Eskine, & Natalie Kacinik, Department of Psychology, Brooklyn College and the Graduate Center, City University of New York

Embodied and grounded accounts of cognition claim that our sensorimotor experiences play fundamental roles in our conceptual and representational systems (Barsalou, 1999; Gibbs, 2006; Lakoff & Johnson, 1980), even in the case of some figurative expressions like metaphors (Gibbs & Matlock, 2008; Ritchie, 2008). Idioms belong to a family of figurative expressions whose meaning are not derived from the systematic processing of their component words. While they vary in decomposability and transparency, idioms are sometimes called *dead metaphors* because the original metaphorical link between conceptual domains that gives their meaning is no longer evident. However, recent research suggests that idioms are not dead and that they actively recruit somatotopic motor regions, mental imagery, and underlying conceptual metaphors (Boulenger, Hauk, & Pulvermüller, 2009; Gibbs & Bogdonovich, 1999; Nippold & Duthie, 2003). To determine whether the idiomatic (and figurative) representational system is at least partly grounded in bodily experience, participants were directed to hold specific postures or engage in certain actions, while they read a sequence of vignettes describing a courtroom drama and responded to subsequent questions. These actions, vignettes, and questions were designed to test the following idioms: *sticking your neck out*, *sitting on the fence*, *sitting on the edge of your seat*, and *burying the hatchet*. Our results indicated that idiomatic meaning can be induced through sensorimotor experience. Unlike other models of idiomatic representation, which focus on the lexical components of idioms, this research provides evidence that at least some idioms have an embodied component in their representational structure.

PSY – 8 GENERALIZATION AND SEQUENTIAL UNDERSTANDING OF NOVEL AND FAMILIAR EVENTS IN CHILDREN WITH COGNITIVE AND LANGUAGE DELAYS

Tashana S. Samuel (GRAD) and Laraine McDonough, Department of Psychology, The Graduate Center-CUNY, New York, NY 10016 and Brooklyn College-CUNY, Brooklyn, NY 11210

Although a growing literature has investigated generalization and event representation in typically developing children, to date, this issue has been largely unexplored in children with developmental delays. The current research used the generalized imitation paradigm to assess whether children with cognitive and language delays generalize their observations of novel and familiar events with perceptually varied objects while retaining correct sequential ordering of modeled actions. Test events consisted of causal, arbitrary and conventional actions and sequences. Two sets of props were used

for each of the eight tasks: modeling and generalization objects. The generalization objects were functionally similar, yet perceptually dissimilar to modeling objects. Assessments were conducted at baseline, generalization and at imitation. Results indicate that children with cognitive and language delays were apt at generalizing the functions of artifacts to those with variable physical dimensions while retaining correct sequential order in novel and familiar event sequences. In particular, they generalized a lower proportion of causal actions than arbitrary and conventional ones, and no differences were found for sequences at generalization. Ceiling effects were found at imitation, which demonstrated recall for the modeled objects. The findings suggest that despite difficulty of generalizing causal actions, sequential understanding of event representations remained intact.

Supported by The Graduate Center, CUNY Doctoral Student Research Grant

PSY – 9 TEMPORAL AND COMPETITIVE PROCESSES IN THE US PREEXPOSURE EFFECT IN PAVLOVIAN LEARNING.

Alex Desouza (UN) and Andrew Delamater, Department of Psychology at Brooklyn College – CUNY.

We investigated the potential contribution of temporal and competitive learning processes in the US preexposure effect with rat subjects. Animals were pre-exposed for 21 sessions to unsignaled pellets according to a fixed time 30-second schedule or a variable time 30-second schedule. The control group was given two sessions of unsignaled pellet preexposure followed by 19 days of context alone exposure. The animals then received light-pellet pairings for 16 days in a physical context that was either the same or different from where pellet preexposure took place. During this training, the light stimulus was presented for 30s and the pellet was delivered immediately after its offset. We observed that (1) variable time preexposure more severely impaired learning of the light-pellet association than fixed time preexposure, that (2) pellet preexposure in the same context used for conditioning impaired learning more than pellet preexposure in a different context, and (3) fixed time preexposure in a different context actually facilitated learning of the light-pellet association. These results suggest that temporal and competitive learning processes both contribute to the US preexposure effect.

PSY – 10 THE RELATIONSHIP BETWEEN GREEN SPACE EXPOSURE AND SELF-PERCEIVED STRESS

Lima Hossain (HS), Naciah Martinez, Malik Forde, Jordan Griffith, Jamon Davis, Brooklyn Academy of Science and the Environment (BASE)

The purpose of this study was to determine whether there is any association between individuals' exposure to green space and their self-reported stress levels. There is much evidence from diverse fields showing that exposure to nature can yield numerous health benefits (Kaplan, 1995; Ulrich, 1984; Ulrich et al., 1991). It was hypothesized that those who are exposed to green space more frequently will report lower levels of stress. Results from 22 high school students confirmed this hypothesis and specifically showed that those who commute through green space or have plants in their home have significantly lower stress levels than those who do not. Taken together, these results suggest that green spaces might play a more important role in our communities than previously thought. Suggestions are made for enhancing student mood and productivity in the classroom.

PSY – 11 WHOLESOME FOODS AND WHOLESOME MORALS: CAN ORGANIC AND COMFORT FOOD CHOICES INFLUENCE MORAL JUDGMENT?

Sara Galarza (HS), Brooklyn Academy of Science and the Environment (BASE)

Contemporary food advertisements sometimes associate moral terms with organic food (e.g., Honest Tea, Purity Life, E-Conscious, Greater Living, etc.). The purpose of this study was to determine whether thoughts about organic (vs. comfort) foods can influence moral judgments. It was hypothesized that exposure to organic food would create harsher moral judgments and vice versa for those exposed to comfort food. Further, it was also argued that exposure to comfort food might make participants "feel better" and therefore make kinder moral judgments. Finally, the relationships

between various taste preferences and moral judgments were assessed. Results are discussed in terms of their impact on people's everyday lives.

PSY – 12 THE BSI AS A SCREENING TOOL FOR PSYCHOLOGICAL DISORDERS IN PATIENTS WITH TRAUMATIC BRAIN INJURY

Travis A. Alvarez (UN)*, Laura A. Rabin* and Joseph F. Rath**, *Brooklyn College of the City University of New York, Brooklyn NY, **Rusk Institute of Rehabilitation Medicine, NYU Langone Medical Center, New York, NY

This study examines the usefulness of the Brief Symptom Inventory (BSI) as a screening tool for psychological disorders in patients with mild to severe traumatic brain injury (TBI). Psychological disturbances are common among TBI patients, and commonly used standardized questionnaires such as the BSI are useful in detecting and characterizing such disturbances. It has been observed that BSI scores of TBI patients are higher than published normative data, which highlights the issue of misinterpreting TBI patient scores as an indicator of psychological disturbance. For this reason, it is appropriate to develop BSI test norms specifically for individuals with TBI instead of using nonpatient normative comparisons. Participants were a demographically diverse group of 105 adult outpatients (ages 19 to 69) with traumatic brain injuries (ranging from mild to severe) and 51 non-TBI controls (ages 24 to 62) that were systematically recruited from an ongoing study at the NYU Rusk Institute of Rehabilitation Medicine. All participants completed the BSI, a 52-item self-report measure developed to measure psychological problems within 9 domains (e.g., depression, anxiety, hostility). Our goals were to compare differences across item-response distributions between those with TBI and nonpatients and to develop preliminary BSI normative data for patients with TBI. We present these results, which will prove useful to clinicians and researchers seeking to utilize the BSI in an effective and appropriate manner with a TBI population.

PSY – 13 UNCONSCIOUS THOUGHTS OF RELIGION (RELATIVE TO SCIENCE) INCREASE SUPERSTITIOUS THINKING IN RELIGIOUS PEOPLE

Gavin Young¹(HS), and Michael W. Magee², ¹BASE High School and ²Department of Psychology, Brooklyn College-CUNY2, Brooklyn, NY 11210

Even though we live in the modern age of science and understand more about the natural world and how the universe works than ever before, superstitious thinking and behavior continue to play a large role in many people's lives. This research explores how religion and science relate to superstitious thinking and behavior. Results of a survey administered to a sample of BASE high school students, students from Brooklyn College, and an older, almost completely atheistic internet sample revealed a significant positive correlation between paranormal belief and religiosity $r(131) = .522, p < .001$, and revealed a significant negative correlation between superstitious thinking and scientific knowledge, $r(131) = -.606, p < .001$. Inspired by these results, an experiment was conducted to test the hypothesis that religion causes people to be more superstitious. Participants were subliminally primed with words related to religion (versus words related to science); asked to read six short scenarios, and to indicate the degree to which particular events in the story might be related; and to evaluate snowy pictures for possible hidden images. Religious participants who were subliminally exposed to religious words made significantly more connections between the events contained in the scenarios ($M = 3.42, SD = 1.04$) than those who were subliminally exposed to science words ($M = 2.90, SD = 1.15$), $t(75) = 2.112, p = .038, d = 0.48$. However, no significant differences were observed in the snowy picture task. Interpretations and possible reasons for this discrepancy and suggestions for future research are discussed.

PSY – 14 RELATIONSHIP OF PARENT-CHILD REPORTS OF ANXIETY IN A PEDIATRIC IBD SAMPLE

Sarah J. Kann (UN), **Gerri Connaught** (UN), **Dina Khaimova** (UN), Claire J. Hoogendoorn, Alexis M. Briggie, Laura C. Reigada, Department of Psychology, Brooklyn College-CUNY, Brooklyn NY, 11210.

The Screen for Child Anxiety Related Emotional Disorders (SCARED) has been documented as the gold standard for self- and parent-report of anxiety symptoms. Multiple studies have found the correlation between parent and child report on the SCARED to be weak, while parents consistently report lower anxiety ratings than children. However, some research using chronically ill samples have shown that parents report higher anxiety symptoms than children on measures for emotional functioning. The present study will assess whether the relationship between parent-child SCARED reports is unique for a sample of children suffering from Inflammatory Bowel Disease (IBD), and particular whether parents report higher anxiety scores than children.

One hundred and three children, ages 11 to 17 ($M= 14.21$) with IBD and their parents filled out SCARED during a medical visit at a gastroenterologist office.

A t-test for correlated groups revealed that the average total child SCARED score ($M= 14.00$, $SD=11.57$) was not significantly different from the average total parent score ($M=13.21$, $SD=11.85$). Pearson's r correlations revealed that total and subscale scores were strongly to moderately correlated.

Incongruent with community samples and samples using other chronic illnesses, our sample had high correlations, and no significant differences between scores. As the literature concerning the relationship between parent and child reports within the IBD population is sparse, these results may help to establish a unique relationship for this population. These results also have implications for clinicians and researchers using this measure within this population.

PSY – 15 COMORBID SYMPTOMS IN ADOLESCENTS WITH PRODROMAL PSYCHOSIS

Eva Raparia^a(UN), Deborah Walder^{a,b,c}, Maureen Daly^{b,c}, Kathy Chu^a, Neyra Azimov^a, Alex Crumbley^a, Jill Harkavay-Friedman^d, Shelly Ben David^d, Cheryl Corcoran^d,^a Brooklyn College of The City University of New York, ^b The Graduate Center of the City University of New York, ^c Queens College of The City University of New York, ^d New York State Psychiatric Institute

Schizophrenia, a serious mental illness with onset typically during late adolescence into young adulthood, is characterized by positive symptoms (e.g., delusions, hallucinations and odd behavior) negative symptoms (e.g., absence of normal behaviors such as flat affect and decreased function) and disorganized symptoms (e.g., disorganized thoughts). Recently, researchers have focused on the "prodromal" phase of illness, which is marked by attenuated positive symptoms; that is, mild positive symptoms that are detectable but still shy of full-blown psychosis. The prodromal period provides insight into the etiology of schizophrenia and a window of opportunity to potentially thwart the progression of psychosis in individuals at high risk. Individuals in the prodromal phase frequently display a constellation of concurrent non-psychotic clinical symptoms. One aim of the current project is to expand newly emerging literature investigating co-occurrence and pattern of various psychiatric symptoms in the prodromal phase of psychosis. Participants include a subset of prodromal adolescents, ages 14-30 years from a larger diverse urban sample, evaluated using the Structured Interview for Prodromal Syndrome and the Diagnostic Interview of Genetic Studies. Data analyses will be primarily correlational in nature to assess co-occurrence of prodromal symptoms with non-psychotic spectrum symptoms (e.g., depression). Results will be discussed with respect to etiology and comorbidity in the development, course and prognosis of psychosis, with consideration of implications for early identification and prevention of acute illness.

PSY – 16 T-MAZE EXPLORATION WITH SIMULATED MOBILE ROBOTS

Jessica Khaimova (HS)^{1,2} and Frank W. Grasso¹,¹ BioMimetic and Cognitive Robotics Lab, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210, ²Midwood High School, Brooklyn, NY 11210,

Spatial navigation in animal and man-made systems like robots is more efficient when the agent can acquire and use its own knowledge about the environment autonomously. Understanding how animals do this and how robots can be endowed with this ability has been a major area of research in the past 20 years. We used the Webots computer simulation environment to model the performance of Khepera robots in a well-studied spatial task for Crayfish in the T-maze. We programmed these agents with neural networks that allow them to obtain a learning ability. We report here on preliminary trials

developing the maze and testing the reliability of the neural controllers prior to our learning studies. We hypothesized that if a khepera moves left and right in a T-maze for an equal amount of times after 100 trials, then the network is unbiased and the khepera does not have a learning ability. Using the Webots simulation we ran one simulated khepera in a T-maze for 100 trials. After each trial ended, the khepera stopped running and was placed in the middle of the maze for a new trial. The khepera moved to the left side of the T-maze for 81 trials and to the right for 19 trials. This showed that the network controlling the khepera was biased. We conclude that this bias is due to an aspect of the network dynamics that might be used to assist a Khepera robot in learning its spatial environment.

PSY – 17 THE EFFECT OF MATING CYCLE PHASE ON NEST SIZE IN A NATIVIZED POPULATION OF ARGENTINIAN MONK PARAKEETS IN BROOKLYN, NEW YORK

Alfie Supan¹(UN), and Frank W. Grasso^{1,2},¹ Brooklyn College, The City University of New York, Brooklyn, NY, ²Ecology, Evolution and Behavior Program, The Graduate Center, CUNY

Monk parakeets (*Myiopsitta monachus*) are an invasive species in Brooklyn, NY that construct and maintain large, multi-chambered stick nests year round. These nests are built on manmade as well as natural substrates. A more complete understanding of the factors that determine their unusual nest construction behavior would aid ongoing efforts to reduce their impact on human farming and urban infrastructure. A digital, photographic record was made of eight nest sites of nativized monk parakeets in Brooklyn, NY at regular intervals over a two year period. Estimates of nest size were made from these photographs to quantify variations in nest size over the period between the spring of 2008 and the spring of 2010. Significant differences in nest size were found to follow a seasonal pattern with two peaks of construction, one during the spring breeding season and one during the fall ($F(3, 90) = 11.309$, $p < 0.001$). This seasonal pattern indicates that monk parakeet nest construction activity, while year-round, shows epochs of intensified construction that counter-intuitively occurs after the annual fledging period. Initial comparisons with annual patterns of temperature indicate a significant correlation ($r = .392$, $p < .001$). Effect of nest size remain significant ($F(9, 67.05) = 3.17$, $p = .003$) even after the co-variation of nest size with temperature is taken into consideration. The increase in nest construction that occurs after the fledging phase of the mating season indicated alternative purposes for the nest other than rearing young.

PSY – 18 USING NEURAL NETWORK ARCHITECTURES TO ARBITRATE SIMULTANEOUS PERFORMANCE OF CONFLICTING BEHAVIORS IN A MOBILE ROBOT PERFORMING A SPATIAL SEARCH TASK

David Brown (GRAD), Kenny Satzinger and Frank W. Grasso, BioMimetic and Cognitive Robotics Lab, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

Neural network algorithms are known for their ability to simulate properties of biological nervous systems, learning input-output patterns through the manipulation of connection weights between simulated neurons. In this experiment, we search for the optimal set of connection weights for an "instinctual" hard-wired network in a mobile robot, with the aim of developing a basic platform that can be combined with other networks to model more complex behaviors. Connection weights in a neural control network governing two behaviors, phototaxis and obstacle avoidance, were varied at three levels in a factorial experimental design (3x3=9 conditions, 7 replications). The robot was tested in a cluttered environment which contained a single light source, forcing the obstacle avoidance and phototaxis behaviors into conflict. A trial was successful if the robot arrived at the light source without crashing. A two-way anova was performed, comparing different weight combinations on success. Performance was significantly different between levels of phototaxis ($F(2,54)=11.27$, $p<.001$) but not obstacle avoidance ($F(2,54)=1.18$, $p=.314$), with stronger phototactic connection weights producing a higher success rate. An interaction was found ($F(4,54)=2.82$, $p=.034$) which made the tested combinations of low or high obstacle avoidance with high phototaxis particularly effective. These two weight combinations produced perfect performance, making them promising candidates for multi-network systems in the future.

PSY – 19 EXPLORING THE ROLE OF EAR-SHAPE ON DIRECTIVITY SENSITIVITY IN BIOLOGICALLY-INSPIRED ARTIFICIAL EARS

Andrey Moiseyenko^{1,2} (HS), Gregory E. Perrin¹, Frank W. Grasso¹,¹ BioMimetic and Cognitive Robotics Lab, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210, ²Midwood High School, Brooklyn, NY 11210,

Many mammals navigate and hunt prey with using passive auditory localization. Many bat species use active localization, or echolocation to supplement their passive forms of localization. The role of the outer ear (pinna) in this process has received increasing attention recently as researchers explore how ear shape can aid in resolving the vertical direction of a sound source in biological ears. . Our previous research (Perrin, Wang, Müller & Grasso, 2010) has shown that many of features of the ears (the conical *pinna*, the horn-like *tragus*, *pinna*-ridges, and aperture shape) all play specialized roles in bat echolocation. To further examine this effect, we played an FM signal (0-20.0kHz) to geometrically simplified and scaled model of a bat's outer ear, rotating in both azimuth and elevation between FM sweeps to create a composite of outer ear's signal filtering properties. We measured the obtained sound level at each ear position to examine the efficiency with which different sound frequencies would be transmitted relative to the known sound source intensities. This served to map the outer ear's filtering properties. As with our previous work, the results show that adding small structures to a featureless *pinna*, alter the ear's directional selectivity in certain frequencies. These results indicate a potential role of these ear features in bat echolocation.

PSY – 20 CHAMBER-SPECIFIC NEST CONSTRUCTION PATTERNS BY MONK PARAKEETS ACROSS THEIR REPRODUCTIVE CYCLE

Hager Salem (Post Bac)¹ and Frank W. Grasso^{1,2},¹ Brooklyn College, The City University of New York, Brooklyn, NY, ²Ecology, Evolution and Behavior Program, The Graduate Center, CUNY

Cooperative breeding is a topic of importance to behavioral ecologists interested in the evolution of social systems. Monk parakeets are thought to be cooperative breeders (Eberhardt, 1998), sharing in the construction of their enormous stick nests. Previous studies on monk parakeet nest construction (Peterson and Grasso, 2010) behavior show differences in nest construction activity before, during, and after mating seasons. However, this study focuses on the area of nest subject to construction. We hypothesized that breeding specific nest construction is focused on the chamber or chamber entrances rather than the domed nest exterior. This follows from the idea that if specialized construction were required, chambers receiving eggs would have more chamber related nest construction in comparison to the rest of the nest. Approximately 50 hours of video footage of two nests was collected from March to May of 2009, a period corresponding to the courtship, mating, and incubation periods of the monk parakeet reproductive cycle in Brooklyn. Each nest was divided into three types of areas: chamber interior, chamber entrance, outer area for each chamber on each nest. We scored nest construction activity recoding the frequency of stick addition, stick manipulation, stick relocation, and stick removal in these areas. The results show significant variation in total nest manipulations throughout the reproductive cycle. Furthermore, total manipulation is not correlated with total number of birds present on the nest. Contrary to the concept of cooperative breeding, this suggests only a fraction of the parrots present perform nest construction at a time.

PSY – 21 GOAL-DIRECTED DISCRIMINATIVE INSTRUMENTAL RESPONDING AFTER LIMITED AND EXTENDED TRAINING

Rudy Saint-Dic (UN) and Andrew R. Delamater, Department of Psychology Brooklyn College-CUNY, Brooklyn, NY 11210

The goal of this study is to distinguish the effects of over and under training on goal-oriented behavior. We asked if goal-directed responding would give way to habitual performance if explicit discriminative stimuli cued distinct response-outcome relations involving a single instrumental response. If training with multiple responses is critical in the prevention of habit formation, then responding in the present situation after extensive training should become habitual. However, if training with multiple R-O associations is critical, then responding even after extended training should remain goal-directed. Rats

were trained for either 12 or 36 sessions to lever press for food pellets in the presence of one discriminative stimulus and for sucrose in the presence of a second (S1: R-O1; S2: R-O2). One of the rewards was then devalued (through aversion training), and the effect of this treatment on lever pressing in the presence of the two Ss was assessed during an extinction test. Instrumental responding in this test remained goal-directed after both limited and extensive training conditions.

SCAS – 1 SUBJECT-VERB AGREEMENT IN THE INPUT TO MEXICAN SPANISH-SPEAKING TODDLERS

Mariela Alda¹ (UN), Angela Goppion¹ (UN), Esther Williams¹, Sarah Kresh², Prof. Isabelle Barriere¹,¹Brooklyn College, Brooklyn, NY, ²Graduate Center CUNY, New York, NY

While the early literature on the acquisition of syntactic dependences including subject verb agreement relied on the analyses of speech language samples, more recent studies have explored the comprehension of this morphosyntactic principle. Young children's comprehension of subject-verb agreement in stimuli that involve single cues has been investigated in English, French, Spanish and Xhosa and different results that still remain unaccounted for have emerged from these studies.

For instance while the results on French demonstrate that 30 month old children understand equally well singular and plural subject-verb agreement, Spanish-speaking children perform better on plural stimuli that involve pro-drop transitive constructions.

The aim of this analysis was to characterize the Spanish input with respect to the proportions to a) of pro-drop constructions, b) pre and post verbal subjects and c) singular and plural constructions. Two Mexican Spanish CHILDES (MacWhinney, 2000) corpora were analyzed. The results will be discussed in relation to a) the comprehension of subject-verb agreement by Spanish-speaking children and b) the results of similar analyses on the French input and the performance of French toddlers on a similar experimental task.

SCAS – 2 NOUNS AND VERBS IN KYRGIZ ADULT AND CHILD LANGUAGE

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Although Kyrgyz is the official language of the Kyrgyz republic and is the first language of about five million people (who reside in Kyrgystan, China, Afghanistan, Kazakhstan, Turkey, Uzbekistan, Pakistan and Russia), it has been the focus of very few linguistic studies.

Kyrgyz belongs to the Altaic Turkic Western Aralo-Caspian language family. It is an agglutinative language that has vowel harmony and rich morphology. Nominal morphology involves six distinct cases (Nominative, Accusative, Genitive, Dative/Allative, Locative and Ablative) marked with suffixes. Verbal morphology involves the use of three distinct sets of personal suffixes that depend on the tense, mood and finiteness of the verbs. Tense, Aspect and Mood are expressed through the use of verbal suffixes, verbal nouns and participles, converbs (i.e. non-finite verbs used to express coordination and subordination) and auxiliaries. To the best of our knowledge, a) the few linguistic descriptions of Kyrgyz focus on the written literary registers rather than the characteristics of the spoken language and b) the early stages of the acquisition of Kyrgyz as a first language have not been documented.

A forty minute recording of a two year old Kyrgyz-speaking child interacting with her mother and grand-mother was fully transcribed and analyzed. The analyses focused on the nominal and verbal morphological markers produced by the child and the adults.

The results will be discussed in relation to whether early uses of nouns and verbs by a Kyrgyz-speaking child are underpinned by productive principles.

SCAS – 3 THE RESPONSES OF CHILDREN WITH DOWN SYNDROME TO COMMUNICATION BREAKDOWNS

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The aim of this project was to explore the response of children with Down Syndrome to communication breakdowns. This population is characterized by low cognitive development and depressed language skills.

In typically developing children between 17 and 25 months- an age range during which they produce their first word combinations- responses to communication breakdown have been found to include at least three types of repairs:

- a) Repetition which consists of the reproduction of the exact same word or word combination;
- b) Revisions that involve a verbal or gestural change compared to the original utterance;
- c) Abandonment that consists of change of focus.

Revisions were the most frequent followed by repetitions and abandonment were rare across all children studied by Fagan (2008).

Given the limited language skills of children with Down Syndrome, it was predicted that their repairs would include a higher proportion of repetitions than revisions: repetitions require less linguistic competence than revisions which necessitate the understanding of the need for the repair and the use of alternative linguistic resources (i.e. a different word and/or sentence structure).

This hypothesis was tested by applying the analysis developed by Fagan (2008) to speech samples collected on four children with Down Syndrome (Rondal, 1978, MacWhinney, 2000) whose length of utterances matched that of the typically developing children. The results support the hypothesis: repetitions were much more frequent than the two other types of repair. The clinical implications of these results will be discussed.

BIO – 1 CHARACTERIZATION OF DIFFERENT MICROALGAE STRAINS WITH ULTRA-HIGH PERFORMANCE LIQUID CHROMATOGRAPHY AND MASS SPECTROPHOTOMETER FOR BIOFUEL PRODUCTION

Juergen Polle and Florenal Joseph (GRAD), Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

For more than two decades, researchers are working to searching for renewable, economical, and environmentally friendly substitutes for fossil or crops derived transportation fuel. Traditional biofuels are mainly relied on ethanol and biodiesel that are mostly derived from crops, which require the displacement of food and a large space for production.

Algae present one of the most exciting possibilities as a solution to our energy problems, especially that of transportation fuel. The Department of Energy, of USA, reported that algae yield thirty times more energy per acre than land crops such as soybeans. However, selection of the optimal algal strain is the key component of a successful algal biofuel venture. With more than three thousands of possible strains we have in our laboratory to choose from, this seems like easier said than done. Therefore, to overcome this challenge, after more than two thousands of algal strains have been screened, we do the total lipid extraction and run through an UHPLC_MS for a qualitative analysis of the strains. In our analysis, we presently focus on different types of triacylglycerides (TAGs) present in each algal strain. We identify, the TAGs based on their molecular mass and their retention time. It has been shown that the short chains saturated Fatty Acids ranging from C8 to C15 are ideal for Jet Fuel production due to their high energy density and low temperature properties. Hence, considering these important characteristics, we also classify TAGs composed mainly of short chains of Fatty Acid versus those composed of long chains of Fatty Acid mostly ranging from C16 to C20.

BIO – 2 THE ROLE OF THE GAMCP GENE IN THE GAMETE FUSION DEFECTIVE PHENOTYPE IN *CHLAMYDOMONAS REINHARDTII*

Dimtry Y. Brogun (GRAD) and Charlene L. Forest, Department of Biology, The Graduate School and Center of The City University of New York, 365 Fifth Avenue, New York, NY 10016, Brooklyn College-CUNY, Brooklyn, NY 11210.

Chlamydomonas reinhardtii is a model organism used to study gamete fusion. Gamete fusion in cells of the *C. reinhardtii* proceeds via four stages: 1) flagella recognition 2) signaling 3) mating structure adhesion and 4) fusion with subsequent zygote formation. We have used temperature sensitive and insertional mutants, which are able to agglutinate but not fuse. Our main objective is to identify whether the gamCP gene product is responsible for gamete fusion. Preliminary, genomic and Site Finding PCR data suggests that a fusion defective insertional mutant has a plasmid inserted in the gene located upstream of the gamCP gene on chromosome 13. In order to determine whether the gamCP gene is defective in our mutants, we are walking on chromosome 13 via PCR reactions. PCR products are being sequenced and aligned. To further analyze whether the gamCP gene may be causing the fusion defective phenotype, qRT-PCR is being used to determine its expression levels in *wt* and fusion defective mutants. We hope both sequencing and qRT-PCR will allow us to decipher whether the gamCP gene is needed for fusion in this organism. It is expected, that the results from this study will provide further insights into mechanisms responsible for gamete fusion in algae and other organisms.

This work was supported by a grant from the Eunice Kennedy Shriver National Institute of Child Health & Human Development (NIH).

BIO – 3 CAN HIGH FREQUENCY, LOW MAGNITUDE VIBRATIONS ACCELERATE REGENERATION IN *EISENA FETIDA*?

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This research will determine if short-term high frequency, low magnitude vibrations can accelerate regeneration in *Eisena Fetida*, a type of earthworm adapted to decay organic material. A study

conducted at the Center for Biotechnology at the State University of New York at Stony Brook (Rubin 2007), reported that six weeks of exposure to high-frequency, low magnitude mechanical signals directed the cells of mice to turn into bone instead of fat.

For each trail, three redworms were maintained in each of two containers, given equal amounts of food and water and kept in worm bedding at room temperature. The tails of six worms in both containers were severed at five to seven segments from the tip of the tail. Three redworms while in the experimental container were placed on the platform of a stirrer. They were exposed to vibrations at a rate of 1100 rpm, twenty minutes daily on weekdays. The cut ends were examined with a magnifying lens every one to two days for a period of about ten days or until they were completely healed. The worms exposed to vibrations healed at least one to two days faster than the control group. Since vibrations affected cell development in prior animal studies, high frequency, low magnitude vibrations may stimulate cell growth and healing in human tissues.

BIO – 4 SEARCH FOR *ECE1* FUNCTION DURING HYPHAE FORMATION IN *CANDIDA ALBICANS*

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Candida albicans is a dimorphic fungus that can change its mode of growth from a budding yeast form to hypha depending upon environmental conditions. Previous studies showed that *ALS3* (agglutinin-like sequence) and *ECE1* (Extent of Cell Elongation) are genes that encode hyphal-specific proteins. *ALS3* belongs to the *ALS* gene family, which encodes glycoproteins involved in cell adhesion. *ECE1* is associated with cell elongation during hyphal formation but its functions are not fully understood. The aim of this project is to determine the phenotype of a double knockout *als3* and *ece1* strain during hyphal growth and biofilm formation. We are using the *URA3-dpl200* cassette which is a method for disrupting genes in *C. albicans*. Plasmid pDDB57 containing the *URA3-dpl200* cassette ligated into the vector pRS315, was transformed into *E. coli*, amplified, and purified using a Miniprep Kit (Qiagen). Recovered plasmid was analyzed by agarose gel electrophoresis. PCR amplification of the *URA3-dpl200* is currently ongoing. The disruption of both *ECE1* and *ALS3* *C. albicans* genes would yield additional insights into the function of these genes in hyphal growth and biofilm formation. Supported by New York City Louis Stokes Alliance for Minority Participation (NYC-LSAMP)

BIO – 5 EVOLUTION OF THE GRAPE FAMILY (VITACEAE): PHYLOGENETIC PLACEMENT OF THE VIETNAMESE SPECIES

Ashley Colon (HS), **Claudia Sencion** (HS), Susan Pell and Thế Cường Nguyễn, Brooklyn Academy of Science and the Environment, Brooklyn, NY

The grape family (Vitaceae) includes approximately 14 genera and is widely distributed on the continents of Africa, Asia, Australia, Europe, North America, and South America. It is most well known for its edible grapes and the wine and juice into which they are processed. As part of a large collaborative project with a graduate student studying the taxonomy of the grape family in Vietnam, the purpose of this study is to determine where and how often Vietnamese Vitaceae species occur in the phylogeny of the entire family. The initial hypothesis was that over time these species have evolved from multiple lineages within the family and therefore are paraphyletic. DNA was extracted from 34 dried leaf samples that were collected by Cường Nguyễn during his thesis research. Molecular procedures conducted on the samples included Polymerase Chain Reaction (PCR), PCR purification, gel electrophoresis, and automated DNA sequencing. Three chloroplast markers were used in this study: *atbB-rbcL*, *trnL-trnF*, and *rps16*. DNA sequences were edited, aligned, and analyzed using standard methods of parsimony. The resulting phylogenetic trees are presented below.

BIO – 6 THE EFFECTS OF HERBS ON BACTERIAL GROWTH

Bethany H. Springer (HS), James Madison High School, Brooklyn, NY

The role of antibiotic in modern medicine is so important, that a built up resistance can devastate mankind. Antibiotic resistance occurs when bacteria change in such a way that reduces or eliminates

the effectiveness of the antibiotic drug (3). Studies have shown the importance of the use of antimicrobials on herbs. I chose to explore a herb that was not as well known. It is my belief that less popular herbs that can also produce great antimicrobial effects. The more that is known about other herbs will help draw an important conclusion about the efficacy of herbs in antimicrobial resistance. Burdock has been traditionally labeled as the blood purifier. The burdock unencapsulated root was used for this experiment. The stock solutions consist of 10mg/ml, 5mg/ml, 2mg/ml and 1mg/ml. A total of four dishes are made for each stock solution. The bacteria used in the culture were Escherichia coli, E. coli. Disposable sterile inoculation loops were used to scrape an amount of E. coli from the culture tube. The petri dish was scrapped slowly horizontally, then vertically. This amount of E.coli was then resuspended in 1 ml sterile nutrient broth. The tube containing this mixture was incubated overnight at a temperature of 37°C. The results were noted daily on any changes that were taken place. Increased concentration of herbs can inhibit bacterial growth.

BIO – 7 A NOVEL FUNCTION OF MCK1P, A YEAST HOMOLOGUE OF GSK-3 KINASE, IN THE CONTROL OF DNA REPLICATION

Amy E. Ikui, Raphi Bollag, Kadidia Adula (UN), Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

Orc6p is part of the replicative complex (pre-RC) which binds to the origin of DNA replication to initiate DNA replication. DNA replication has to take place only once per cell cycle. After initiation, pre-RC components are phosphorylated by cyclin/CDK complex. We have previously shown that S-phase cyclin (Clb5p) binds to Orc6p to inhibit a second round of DNA re-replication. To better understand the Orc6p function in *Saccharomyces cerevisiae*, synthetic genetic array (SGA analysis) was performed using an Orc6 mutant, ORC6-*rxl*. The ORC6-*rxl* mutation eliminates Clb5-Orc6p protein binding, but these strains are viable. We looked for haploid gene deletion strains in which ORC6-*rxl* was synthetically lethal. We found that *mck1* deletion cells showed synthetic lethality with the cells containing the ORC6-*rxl* mutation. MCK1 is a yeast homologue of GSK-3 kinase. In order to analyze the phenotype of the synthetic lethality between *mck1* and ORC6-*rxl*, a temperature sensitive mutant, ORC6-*rxl mck1-16* was created. FACS analysis showed a peak at more 2C DNA content in the ORC6-*rxl mck1-16* mutant when incubated at non-permissive temperature. The *mck1* deletion cells also showed lethality with other *orc* mutants such as ORC6-*ps* and ORC2-*ps*. The lethality in the ORC6-*rxl mck1-16* mutant depends on DNA damage checkpoint genes such as MEC1 or MRE11. Previously we have shown that that DNA re-replication induces DNA damage pathway. Cdc6p was stabilized in the *mck1* deletion strain suggesting that Cdc6p phosphorylation by Mck1p is an additional mechanism to inhibit DNA re-replication.

BIO – 8 GENOME-WIDE MODELING AND ANALYSIS OF PX DOMAINS FROM THE MODEL ORGANISM *ARABIDOPSIS THALIANA*

Shaneen Singh, Richard Napier (GRAD), Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210.

Arabidopsis thaliana may not be known for having large extravagant flowers; however, the importance of this small plant in the biological world can't be stressed enough. Arabidopsis has one of the smallest plant genomes and was the first plant genome to be sequenced. It has become an integral part of many research studies assisting in the understanding of different metabolic mechanism at the cellular level. In this study we use this model organism to understand the role and mechanism of a lipid binding domain that is a key component of many different signaling pathways in plants. The phagocyte oxidase homology or PX Domain which has been implicated in membrane targeting and the recognition of lipids, called phosphoinositides, that are also important secondary messengers of signaling pathways. Displaying extreme specificity to lipid binding the PX domain has been designated as a member of the large super family of phosphoinositide binding proteins with diverse signaling properties. This study through the use of computational techniques, attempts to fill this void by trying to identify, model, analyze, and annotate functionally all PX domains found in the genome of *Arabidopsis*.

BIO – 9 ANNOTATION OF PHAGE GNR19

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GNR19 was found and captured on the Brooklyn College Campus in Brooklyn NY. The phage was effective in killing *Mycobacterium smegmatis*. GNR19 is a lytic phage with an average plaque diameter of 0.25cm and circumference of 0.78cm. The small size of the plaque indicates the phage has a large head. The harvested and purified DNA then underwent RFLP and sequencing analysis. Supported by HHMI, LSAMP, and BROOKLYN COLLEGE

BIO – 10 STRUCTURAL ANALYSIS OF THE PROTEIN KINASE DOMAIN IN MYOSIN III

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Myosin's are ATP-dependent Actin based motor proteins that are known to play fundamental roles in many forms of eukaryotic motility such as cell-crawling and phagocytosis. Nevertheless they are more popularly referred to as "muscle proteins" due to the first myosin class (myosin II) being isolated from muscle and its exposition as an essential protein in muscle contraction. However over the years, scientists have steadily discovered the wide size and diversity of the myosin superfamily. As of 2009, there were 18 recognized myosin classes with more classes up for recognition from the scientific community. Each class of myosin displays unique molecular features that are likely to mediate distinct functions in different cell types. Nonetheless they all share the basic properties of actin binding, ATP hydrolysis (ATPase enzyme activity), and force transduction. Furthermore, structurally most myosin molecules are composed of a head, neck, and tail domain.

Our study centers on the myosin III class, which is a poorly understood member of the myosin family but is thought to play an important role in maintaining the structural integrity of photoreceptor cell microvilli. They are proteins containing an N-terminal serine/threonine kinase catalytic domain (STKs) and a C-terminal actin-binding domain. The primary focus of our study is interested in investigating the kinase catalytic domain (STKs) of myosin whose function is essential in signal transduction within the cell. Through sequence and structure analysis, we wish to work on a detailed comparison of the kinase domain throughout a wide array of experimentally important organisms. Comparisons include catalytic site conservation, tertiary structure modeling and secondary structure analysis, and elucidation of the biochemical aspects relevant to its function. This analysis is expected to provide us with a better understanding of the role of the kinase domain in the overall function of myosin III.

BIO – 11 EVALUATION OF SOLVENTS USED IN ALGAL LIPID EXTRACTION

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In order to obtain a qualitative and quantitative analysis of algal biomass, extraction is performed prior to ultra high-pressure liquid chromatography (UHPLC) and mass spectroscopy. It is the goal of this study to determine the effectiveness of different solvents used in this extraction procedure with respect to the type and quantity of lipids obtained. The solvents which will be used are dichloromethane/methanol (2:1) and pure hexane. Analysis of such organic compounds produced by the green and orange algal strains studied can provide valuable insight into their metabolic pathways. Additionally, with such information the possibility of increasing the yield of specific metabolites is introduced, particularly that of lipids which bear the potential to be used as biofuels.

BIO – 12 ASSESSING LIPID SCREENING OF NOVEL CANDIDATE MICROALGAL STRAINS FOR BIOFUEL APPLICATIONS

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Driven by the need to replace fossil fuels with third generation biofuels, the candidate selection of isolated wild micro algae has been steadfast using spectroscopic Nile Red lipid screening. This protocol uses two parameters: Nile Red fluorescence of triacylglycerides (TAG) at 485nm and

chlorophyll-a fluorescence at 750nm. Weekly lipid screenings provide graphed data that depict relative lipid accumulation and cell proliferation. Consequently the basis behind the primary candidate selection exploited implicit spectroscopic data values. The objective of this experiment is to explore and correlate implicit spectroscopic Nile red lipid screening data with explicit UHPLC/TOF-MS spectra TAG analysis and biomass measurements of three candidate strain cultures over a period of a month. Strains are inoculated into duplicate 50 mL cultures with Bold's Basal Medium (BBM) and incubated at constant temperature and lighting. On a weekly basis small aliquots of the strain will be extracted for lipids. Ultimately identification of TAG in these candidate strains using the TOF-MS will give further insight in TAG accumulation of other micro algal strains.

BIO – 13 MYCOBACTERIOPHAGE BROOKLYN

Lijie Chen (UN), Martha B. Dua-Awereh, Zhongqi Cheng¹ and Rafael Ovalle²

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The Phage Hunters Workshop is a research project with the main goal of finding phages that can attack *Mycobacterium smegmatis*. *Mycobacterium tuberculosis*, the organism that causes tuberculosis in human currently effects 1/3 of world population and causes millions of death annually. Finding a mycobacteriophage that attacks *M. tuberculosis* may yield new biomedical methods for dealing with antibiotic-resistant tuberculosis. Non-pathogenic *M. smegmatis* is a close relative of pathogenic *M. tuberculosis*. *M. smegmatis* was used as a preliminary screening organism during the workshop. Mycobacteria are relatively abundant in organic-rich soil and water. Soil samples were collected from Prospect Park, Marine Park, and on Brooklyn College campus, New York; GPS coordinates and detailed records of landmarks were documented. Samples were tested for mycobacteriophages by adding soil samples to growing bacteria cultures, then after an incubation period adding media filtrates to *M. smegmatis* cultures embedded in agar to detect for phages. A lytic phage named *Brooklyn* was isolated from Marine Park marsh soil sample, 40.60174N, 73.93079W. The phage was purified using serial dilution; the high titer lysate concentration was over 1×10^{10} PFU/mL. Phage *Brooklyn* DNA was extracted, digested with endonucleases for RFLP analysis; initial results indicated that Brooklyn is a member of A2 mycobacteriophage cluster. Phage *Brooklyn* was partially sequenced and resolved to 9 contigs. The two largest contigs (20 kbp, 13 kbp) show close sequence similarity to Phage D29, a member of the A2 mycobacteriophage cluster.

BIO – 14 ISOLATION AND ANALYSIS OF MYCOBACTERIOPHAGE BFREE1

Ronald D. Peaster (UN), Rafael Ovalle, Medgar Evers College¹ and Brooklyn College²

There is an abundance of mycobacteriophages in the environment. Phage Bfree1 was found at the base of a tree located in Brooklyn N.Y. at coordinates 40.631944° N and -73.945590° W. Viral enrichment protocol identified Bfree1 as being lysogenic to *Mycobacterium smegmatis*. Serial dilutions of phage Bfree1 were performed from 10^0 to 10^{-7} . The estimated concentration of virions in the original high titer lysate is estimated at 3.67×10^7 PFU/mL. Phage Bfree1 DNA was extracted and RFLP analysis indicates that the phage is a member of the F1 cluster. Agarose gels show that Bfree1 digest fragment are similar in size and number to phage Boomer. TEM images of Bfree1 at 60000x show that the phage has an isometric head that measured 60nm and a 160nm flexible tail. Information about Bfree1 can be found on the Mycobacteriophage Database website (phagesdb.org).

BIO – 15 ISOLATION AND CHARACTERIZATION OF LYSOGENIC MYCOBACTERIOPHAGE BUISSON

Rafaelina D. Rodriguez (GRAD), Martha B. Dua-Awereh, Rafael Ovalle (Faculty mentor)

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Pathogenic bacteria, like *Mycobacterium tuberculosis*, are the leading cause of deaths worldwide because of their ability to rapidly mutate and exchange DNA in order to exploit new environments. Finding viral treatments for a disease means lowering the number of deaths and lessening the amount of antibiotic resistant species of bacteria. Phage hunting is the active search of viruses that can infect and kill mycobacteria. Soil samples were collected from various parks of the metropolitan

area of NYC, mainly in Brooklyn. A sample positive for mycobacteriophages was found in soil taken from a potted bush (Buisson) near the entrance gates to the Brooklyn College campus area at GPS coordinates N 40.63207, W 73.94863. The isolation of the mycobacteriophage Buisson was accomplished through direct plating and enrichment plating procedures. Circular lysogenic plaques of 0.33cm in diameter were detected in an *M. smegmatis* lawn, indicating a successful infection. After initial identification, phage Buisson was purified via serial dilution of a filtrate and phage Buisson was isolated as a single species. Restriction Fragment Length Polymorphism Analysis of Buisson's DNA was made using restriction enzymes BamH1, Cla1, EcoR1, HaeIII and Hind III. The phage's DNA fingerprint resembles those found in the F1 cluster of the HHMI database. About 90% of Buisson's genome has been sequenced, and BLAST analysis confirms it is part of the F cluster, with closest resemblance to phage Tweety. Characterization of novel phage Buisson means adding to our sponsor's database at HHMI and an increased probability of finding a cure for tuberculosis.

BIO – 16 COMPUTATIONAL ANALYSIS OF GRAM DOMAINS IN THE MODEL PLANT ARABIDOPSIS THALIANA

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The goal of this study is to use the model plant *Arabidopsis thaliana* to understand the role and mechanism of the lipid binding domain, GRAM. Previous studies have uncovered that GRAM domains are present in glucosyltransferases, myotubularins and other membrane-associated proteins, and are structurally similar to PH domain but may have functional differences and/or membrane binding mechanisms. The main focus of our study is to identify all GRAM domain containing proteins in this model organism, evaluate their location with in different proteins and analyze their functions to see whether they are similar to the PH domain or not. PH domains are typified by 7 beta -strands and a C-terminal helix. We have examined the location of potential GRAM domains in 15 different proteins in *Arabidopsis* and successfully modeled their three-dimensional structure. However, it is not clear whether GRAM domains contain all 7 of the beta strands found in the PH domains despite their structural similarity. Through various computational biology tools, we present our functional analysis of the modeled domains including the docking of phosphoinositide ligands such as I3P, I4P, I5P, etc. to elucidate their membrane binding preferences and modes.

Supported by NSF Grant 0618233

BIO – 17 ISOLATING RAPHAEL: MYCOBACTERIOPHAGE FROM SOILS IN MARINE PARK, BROOKLYN, NY

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Some mycobacteria are pathogenic and cause mammalian diseases such as tuberculosis. Mycobacteriophages are viruses that infect mycobacteria. The objectives of this study were to isolate a soil bacteriophage from Brooklyn, NY, obtain a pure phage population, and analyze the molecular composition of the novel phage. Using host organism *Mycobacterium smegmatis*, a non-pathogen, and protocols from the NGRI Phage Resource Guide, mycobacteriophages were obtained by filtering soil samples collected from the local environment, inoculating *M. smegmatis* with the sample filtrate, embedding the infected bacteria in solidifying agar, and observing the presence of the phage as an appearance of plaques on Middlebrook 7H10 Top Agar plates. Once the phage was detected, serial dilutions of the phages were performed to obtain a pure isolate, Raphael. Analysis of the molecular makeup of Raphael was achieved by isolating and extracting its genomic DNA with a commercial DNA extraction kit. On the extracted phage DNA, agarose gel electrophoresis, RFLP analysis, and genomic sequencing were performed. The morphology and molecular composition of Raphael was compared to previously identified species of mycobacteriophages in the Howard Hughes Medical Institute (HHMI) database. Data collected from the sequencing of the Raphael's genome will contribute to the research dedicated to developing medical treatments for tuberculosis.

BIO – 18 COMPARATIVE ANALYSIS OF *A. TUMEFACIENS* ADHESION TO *ARABIDOPSIS THALIANA*

Salisa Hudson¹ (UN), Anna Petrovicheva^{1&2}, Theodore R. Muth¹. Brooklyn College¹ and CUNY Graduate Center²

Crown gall disease caused by *Agrobacterium tumefaciens* is detrimental to plant health and agricultural productivity. *Agrobacterium* attaches to plant roots and transforms the plants cells causing them to develop tumors. The mechanism for attachment is poorly understood. Determining the difference in the level of attachment between the wild type C58 strain of *A. tumefaciens* and variant strains would help provide a basis in understanding the mechanism of bacterial attachment. The methods used as the basis of comparison and in establishing the standards of the experimental attachment in the experiment were plate colony counting and microscopy.

The attachment levels of wild-type variants At1529, A208 and non virulent C58c1 strains were compared to wild type *Agrobacterium tumefaciens* to ultimately correlate the genetic variation to the difference in binding levels. *Sinorhizobium meliloti* and *A. radiobacter* are also used in the experiment as a basis for comparison. *Sinorhizobium* is a nitrogen fixing symbiotic species and *A. radiobacter* is non-pathogenic (non-virulent) relative of *A. tumefaciens*. Variance in attachment could give us an idea of the mechanism for attachment or an important factor in it. The goal is to identify a significant difference in the binding of C58 to any or all of the *Agrobacterium* strains evaluated. The attachment work is important because the mechanism for it is largely unknown. *Agrobacterium* strains proved to have varied attachment levels than the wild -type.

BIO – 19 CAN THE ADDITION OF VINEGAR TO CULTURES OF *SACHAROMYCES CEREVISIAE* INHIBIT SUGAR BREAKDOWN?

Ilna Kvasnitska (HS) and Steven Dominguez (HS), Abraham Lincoln HS, Brooklyn, NY

A 2004 study published in Diabetes Care found that adding a vinegar solution before a carb-heavy meal had a significant reduction in the blood sugar levels of people in the study compared to the participants who did not consume the vinegar solution. The vinegar seemed to slow the absorption of sugar into the bloodstreams by interfering with the digestive enzymes that convert carbohydrates into glucose. This research will determine if yeast cultures are similarly affected by the addition of vinegar as the yeast cells undergo metabolism and produce CO₂.

Yeast cultures are prepared by adding 1g of baker's yeast and 5g of sucrose to 35 mL of water. For each trail 15 mL of the mixture is added to each of the calibrated tubes (1-5mL). 20 drops (1mL) of 5% vinegar was added to the experimental tube. The volume of CO₂ was recorded for each tube after a given amount of time. After numerous trials the amount of generated CO₂ was significantly less in the tubes containing 1mL of vinegar.

This research which demonstrated the slowing down of sugar metabolism in yeast cultures with vinegar corroborated similar results in human studies. This finding adds to the credibility of using *SACHAROMYCES CEREVISIAE* as a model organism for our understanding of the stages of human cell division and possibly adding to our understanding of cancer.

BIO – 20 IDENTIFICATION OF NOVEL STRAINS OF MICROALGAE AS POTENTIAL CANDIDATES FOR BIOFUELS PRODUCTION

Gertie S Pierre (UN), William Chan (UN), Sophia Registe, Mahendra Perumal, and Juergen Polle, Laboratory of Experimental & Applied Phycology, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

The need to find new alternative energy in countries around the world is stimulating interest in the area of biofuels from microalgae. Microalgae are of considerable interest, because some strains have the capability to produce triacylglycerides, which are important for the production of biofuels such as jet fuel and biodiesel. Although there are large-scale commercial facilities that grow algae, these facilities grow algal strains that are used for non-biofuels applications. Scientists are collaborating in the area of algal biofuels in the hopes of finding the optimal source for renewable energy. One of the best possible ways of improving biofuel production by microalgae is to identify novel hyper-accumulating, but robust strains through the process of algal strain isolation and screening. Isolation of

new microalgae starts by collection of strains from a diverse range of environments as to find the best that will contribute to high oil production. Screening of microalgae strain includes the study of growth physiology and metabolite production as well as strain robustness. The process of strain isolation involves a series of steps starting from sampling to cell sorting via cell sorter and then to a high throughput method of screening for lipids by use of the fluorescent dye Nile Red. After screening, the most promising candidate strains are chosen to be cultivated in bubbling columns to assess their lipid productivity. To date about 1,000 novel strains were isolated, about 300 hundred of these strains were screened, and several candidate strains were tested for lipid productivities.

Acknowledgements: US Department of Energy

BIO – 21 DOES PEPSTATIN A INHIBIT THE SHEDDING OF THE ALS5 PROTEIN IN SACCHAROMYCES CEREVISIAE?

Gavin-Rae Barnaby¹(HS), Caleen Ramsook², and Peter Lipke², ¹Edward R Murrow High School and ²Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

The yeast *Saccharomyces cerevisiae* has been discovered to inexplicably shed an external protein, Als5. The goal of this study is to find the cause of this apparent shedding. The protein is hypothesized to be cleaved off the cell's surface by an aspartyl protease. To test whether that is the case, an aspartyl protease inhibitor, Pepstatin A, was added to the growth media. If the hypothesis were valid, the enzyme would cease to function, thus preventing the protein from being cleaved. The results show that even after the inhibitor was added, the protein continued to shed off the cell's surface, suggesting that the aspartyl protease is not responsible for the protein shedding.

BIO– 22 CAN DIAPER MATERIAL PROVIDE A SUITABLE GROWTH MEDIUM FOR PLANTS?

Daniel Goisman (HS), **Khaing New Phoo** (HS), **Amir Elbahnasawy** (HS), James Madison High School, Brooklyn NY

An investigation was performed using the polymer material, identified as polyacrylic acid that is contained in disposable diapers. When this material absorbs a quantity of water, it turns into a gel-like substance and is used in the diaper to hold liquid waste. This diaper polymer material will be investigated to test two ideas.

The major hypothesis investigated was whether seeds can grow within the diaper polymer to see if this material is capable of supporting plant growth and to determine if the growing plants can make use of the stored water.

For this experiment, radish seeds and bean seeds were used as test organisms. Experimental controls consisted of plants grown in traditional potting soil and seeds placed in water. One potential use of the polymer being considered is for the cultivation of plants in space environments such as the NASA International Space Station. Plants may be used to provide oxygen through photosynthesis as a more natural approach than mechanical scrubbers. This approach may make it possible to colonize other planets.

The use of moisture filled polymer may also serve to revolutionize hydroponic agriculture by producing a matrix for roots in a semi-solid gel as a replacement for water filled containers. This can provide a more natural growing environment and will reduce water loss through evaporation.

Initial experiments confirmed that the polymer supports plant growth and reduces water loss. It also appears to eliminate the growth of fungus and rot that kills new seedlings.

BIO – 23 IDENTIFYING THE MINIMUM INHIBITORY CONCENTRATION OF GOLD COMPOUNDS AGAINST BACTERIAL AND YEAST STRAINS

Sarya Abi-Habib^a(GRAD), **Karina Suriei**^a(GRAD), Malgorzata Friek^b, Maria Contel and Theodore R. Muth^a, ^aDepartment of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210, ^bDepartment of Chemistry, Brooklyn College-CUNY, Brooklyn, NY 11210

Twelve gold and silver compounds were tested, five with 1,2 Bis(diphenylphosphino) ethane (dppe) and five with 1,2-Bis(di-3-pyridylphosphino)ethane (dppy). The goal of this study is to identify the minimum inhibitory concentration (MIC) of the compounds against different microorganisms. The compounds were evaluated against Gram-negative (*E. coli* and *S. typhimurium typhimurium*), Gram-

positive (*B. cereus* and *Staphylococcus aureus*) bacteria, and yeast (*S. cerevisiae*). Testing was also performed to establish the minimum bactericidal concentration (MBC). All compounds displayed antimicrobial properties. In most cases, the MIC was at 10µg/ml-100µg/ml and as for MBC testing; all microorganisms were killed within 18 hours.

BIO – 24 HIGH RESOLUTION MELT ANALYSIS CAN BE USED TO DIFFERENTIATE AGROBACTERIUM VITIS STRAINS BY TARGETING CONSERVED TANDEM REPEAT CHROMOSOMAL REGIONS

Igor Britan (UN), Danielle Lombardi (UN), Naomie Delone (UN), and Theodore Muth, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

Agrobacterium is a genus of gram-negative bacteria that use horizontal gene transfer to induce tumor growth in plants. High resolution melt (HRM) analysis is a technique that measures the temperature required to cause double-stranded DNA to melt (separate) into its component strands. This temperature is inherently a product of the sequence of nucleic acids that compose the strands. Previously, we investigated whether HRM analysis can be used to differentiate between two species of *Agrobacterium*, *A. tumefaciens*, and *A. vitis*. We concluded that HRM analysis is sufficient to differentiate between these two *Agrobacterium* species based on the identity of their unique melt-profiles. The second phase of our research considered whether HRM analysis can be used to differentiate between multiple strains of a single species—*A. Vitis*. We designed primers to amplify portions of *A. Vitis* genomic DNA from the tandem repeat region of a flagellum protein on chromosome 1. Sequencing of the amplicons confirmed that, of the subset analyzed, none were identical. We subjected these amplicons to HRM analysis and compared the melt-profile values obtained for each strain type. We found that the within group variance of these values was significantly lower than the variance between groups, although we have yet to reach a point where we can definitely predict the identity of a particular strain based on these values alone. Further inquiry is called for to determine whether HRM analysis is sensitive enough to consistently detect sequence differences between multiple strains of a single species.

BIO – 25 DETERMINATION OF AGROBACTERIUM TUMAFACIENS T-DNA INTEGRATION TIMING

Elvina Habibutdinova (UN), Shoshana Levshin (UN), Vjosana Neziri, and Theodore Muth Department of Biology, Brooklyn College

Agrobacterium tumefaciens is a soil-dwelling bacterium and the causal agent of Crown Gall disease in dicotyledonous plants. The mode of infection of this bacterium is insertion of a segment of its transfer DNA (T-DNA) into the host plant's cell nucleus. This insertion is arbitrarily, as the T-DNA can place itself in various parts of the host plant's genome. In order to be virulent, the bacterium must contain a tumor-inducing (Ti) plasmid, which contains the genes necessary for it to be successfully incorporated into the host plant genome. Once integration takes place, the genes contained in the T-DNA region begin to code for the overproduction of plant growth hormones and the synthesis of nutrients used by *A. tumefaciens*.

Scientists working with *A. tumefaciens* have successfully utilized the standard approach to genetically engineer plants to somewhat modify the harmful effects of the bacterium. They have been able to replace the tumor-causing agents in the bacterium with non-harmful, or often beneficial, traits such as those responsible for pesticide resistance and vitamin production. What scientists have been unable to do however, is to control the timing and location of the T-DNA into the host plant genome.

The long term goal of this research is to develop plant transformation methods that enable site-specific targeting of genes introduced into the plant genome. Our work focuses on determining the timing of T-DNA integration after a plant is exposed to *A. tumefaciens* and its location in the genome, using root transformation and next generation sequence analysis.

BIO – 26 TOWARD STRAIN TYPING HUMAN COMMENSAL *STAPHYLOCOCCUS EPIDERMIDIS*

Sadia Nusrat (HS), Mustufa Khatri, Robert Mansky, Betty Kolod, TR Muth, Department of Microbiology, Brooklyn College-CUNY, Brooklyn, NY 11210

Staphylococcal species comprise 10 to 50% of human commensal bacteria in moist skin regions (1), with *S. epidermidis* serving as a first line defense against infection (2). The protective nature of *S. epidermidis* is attributed to an absence of virulence factors, as compared to pathogen and close relative *S. aureus* (3). The emergence of *S. epidermidis* biofilms (4) underscores the need for tools to distinguish between beneficial and potentially opportunistic strains of *S. epidermidis*. We employ a multiple locus variable repeat region analysis approach in attempt to differentiate between distinct strains of *S. epidermidis* present in samples of moist skin, in a culture-independent fashion. Upon creation of an efficient strain typing technique, *S. epidermidis* strain diversity and turnover rate will be assessed and correlated with lifestyle factors such as commuting method and use of sanitizing hand gels.

BIO – 27 THE ELECTRICAL PROPERTIES OF CHLOROPHYLL EXTRACTED FROM SPINACH LEAVES. WOULD CHANGE IN COLOR CHANGE THE CONDUCTIVITY OF THE CHLOROPHYLL?

Barrington Harvey and **Moneeba Naeem** (HS), James Madison High School, Brooklyn, NY

The goal of my project is to extract chlorophyll from spinach leaves with the use of isopropanol alcohol and mix it with the spinach leaves until it is extracted from the leaves almost completely. Use a meter to record the electrical flow, current, and conductivity of the chlorophyll and of course to examine it's electrical properties, with the meter being placed into the chlorophyll. With this we want to achieve the answer to the question, would change in color change the conductivity of the chlorophyll?

BIO – 28 SUB-NUCLEAR LOCALIZATION OF NUCLEOLIN IS DEPENDENT ON PHOSPHORYLATION BY CK2 AND DNA DAMAGE CONDITIONS

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Nucleolin is a multifunctional abundant nucleolar phosphoprotein. Intriguingly, nucleolin has a diverse array of functions in different cellular compartments: in the *nucleus* it participates in early processing of rRNA, chromatin remodeling, transcription, p53-regulation; in the *cytoplasm* it participates in signal transduction, apoptosis, mRNA stability; and acts as a *membrane receptor*. During an unperturbed cell-cycle, interphase (CK2) and mitotic (Cdc2) kinases regulate nucleolin phosphorylation, modulating its function and nucleolar localization. Following cellular stress, nucleolin has been shown to inhibit chromosomal replication and to relay nucleolar stress signals mediated by its re-localization within the nucleus.

In order to further analyze sub-nuclear re-organization of nucleolin under various conditions, we have engineered a novel system using human osteocarcinoma cells. This novel system allows us to induce expression of 3xFlag-tagged nucleolin-WT (wild-type) or -S6A (a phospho-mutant with six consensus site serines mutated to alanine, impairing phosphorylation by CK2), through Tet-Off tetracycline controlled transcriptional activation.

In this study we examined the sub-nuclear localization of either exogenously transfected or induced nucleolin (WT or S6A) in normal as well as DNA damaging agent CPT-treated cells. We observe that although WT nucleolin is predominantly localized in the nucleoli, the S6A-mutant is also significantly nucleoplasmic. However, both WT and phospho-mutant readily translocate to nucleoplasm upon DNA damage. We propose that nucleolin-phosphorylation status and its exit from nucleoli during cellular stress response might be inter-related. We have begun to understand how nucleolin-phosphorylation and sub-nuclear mobilization influence the p53-tumor suppressor pathway.

This study was supported PSC-CUNY 63776-00 41 grant (AS).

BIO – 29 CAN DRENCHING WITH SUCROSE SOLUTION INCREASE PLANT MASS IN PHASEOLUS VULGARIS

Erica J. Juarbe (HS) and Colin R. Thompson, Abraham Lincoln, Brooklyn, NY 11235

Recent studies have shown that sugar feeding improved root vigor in trees such as silver birch, cherry and red oak. (Glen Percival, Journal of Arboriculture 2004). Sugar drenching has also increased lateral root branching and formation in wheat and barley. This research was designed to determine if sugar drenching will increase plant mass in Phaseolus Vulgaris.

For each trial two beans were planted in each of 20 pots. One week after the bean seedlings developed, 10 pots in each trial were watered with a 5% sugar solution. The remaining ten pots were watered with tap water. A second sugar watering was repeated after 7 days. Two weeks after the second sugar application, all plants were air dried. The total mass of all plants in the control group and experimental groups were recorded and compared. The plants exposed to sugar drenching averaged 43% increase in dry mass compared to the plants which were watered with tap water. Additional trials are ongoing. Sugar enrichment affected plant tissue metabolism and other physiological processes by increasing plant mass in Phaseolus Vulgaris.

BIO – 30 COMPUTATIONAL MODELING OF CYCLOOXYGENASE IN DROSOPHILA

Yan Qi (GRAD), Department of Biology, Graduate Center-CUNY, New York, NY 10016 and **Shaneen Singh**, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

Eicosanoids are important mediators in animals that are involved in reproduction, immune system, ion transport and etc. Eicosanoids are oxygenated from C20 polyunsaturated fatty acids. Mammalian eicosanoid biosynthesis consists of three pathways, COX (cyclooxygenase) pathway, LOX (lipoxygenase) pathway, and epoxygenase pathway. Cyclooxygenase (COX) catalyzes the committed step of biosynthesis of prostaglandins, thromboxanes and prostacyclins. There are two isoforms of COX: COX-1 and COX-2. Both of them are membrane bound proteins. COX exists in many organisms including vertebrates and invertebrates, but has mostly been studied in mammalian systems. In this study, we used computational methods to identify several putative homologues of COX in Drosophila. Using computational biology methods we have built three-dimensional models of all the putative COX enzymes in Drosophila and compared them both at the sequence and structural levels. Our results are a preliminary attempt at uncovering the functional role of these putative COX proteins in the metabolic pathways of Drosophila with an emphasis on their role in immune regulation.

BIO – 31 CONCENTRATIONS OF LACTOBACILLUS IN YOGURT

Dimitri Kverenchkhiladze (HS), **Patrick Kopyto** (HS), and **John Abadeer** (HS), James Madison High School, Brooklyn

The hypothesis of my study is that different brands or types of yogurt contain different concentrations of live bacteria. I will be testing all natural yogurt, low fat yogurt, pasteurized yogurt, and fat free yogurt. In addition I will perform a cell count for each slide of yogurt.

Lactobacillus is a probiotic bacterium with many health benefits to the consumers. Lactobacillus is often found in dairy products such as kefir, yogurt, cultured milk, and certain cheeses. Some of the benefits of lactobacillus are:

- Production of vitamin B and vitamin K
- Promotes optimal fungal and viral levels
- Aids metabolism and breakdown of toxins
- Sustains optimal blood pressure levels

Types of Lactobacillus include: Lactobacillus casei, lactobacillus bifidus, lactobacillus bulgaricus, lactobacillus rhamnosus, and lactobacillus acidophilus.

Materials: 1. Microscope, 2. Different types of yogurt, 3. Tea spoon or swab, 4. Slides and coverslips, 5. Microscope attachment camera

BIO – 32 EFFECT OF DIFFERENT AMOUNT OF SALINITY ON BRINE SHRIMP

Saaqib Chauhdry (HS) and **Andrew Tardona** (HS), James Madison High School

The goal of this study is to discover the highest amount of salt for an *Artemia salina* or brine shrimp to survive in. The purpose that salt is being tested on brine shrimp is because according to research studies, Brine shrimp can tolerate varying levels of salinity. The level of salinity that the brine shrimp prefer is about 30—35 ppt (parts per thousands). The brine shrimps eggs are grown, which is also the first process before testing the level of salinity. Once different amount of salt is added to different jars with the same amount of water, the brine shrimp will be observed. Once the brine shrimps reaction are observed in there jar, we will be able to tell what is the least and greatest amount of salinity they can survive in.

BIO – 33 LIPIDOMICS OF THE UNICELLULAR GREEN ALGA *DUNALIELLA SALINA*

Cassana K. Fisher-Ramos (GRAD) and Juergen E.W. Polle, CUNY-Brooklyn College, Department of Biology, 2900 Bedford Avenue, Brooklyn New York, 11210

Mounting concerns about pollution derived from diminishing non-renewable energy sources such as fossil fuels, along with increasing oil prices has led to developing biofuels from microalgae. Microalgae are photosynthetic organisms that produce isoprenoid hydrocarbons and lipids as part of the photosynthetic process. Microalgae grow and reproduce rapidly; unlike terrestrial plants many algae proliferate in saline environments and even wastewaters; and represent a renewable feedstock for power from biomass. Currently both government agencies and universities laboratories such as the Laboratory for Experimental and Applied Phycology (LEAP), are exploring several algal species that produce isoprenoid hydrocarbons and lipids, which can be used for fuel production. To this end, our research goal is to determine the composition of oil bodies in cells of green algae using *Dunaliella salina* CCAP19/18 as a model organism. We conducted fluorescence microscopy with the aid of Nile Red, a fluorescent dye, to confirm the presence of oil bodies. Currently, a protocol for oil body isolation is being established. Purified oil bodies will be analyzed for their metabolite and protein contents using a UHPLC TOF-MS. Here we will report on the status of the project.

BIO – 34 NUCLEOLIN PHOSPORYLATION BY CK2 MODULATES ITS ROLE IN CELL CYCLE CHECKPOINT

Elif Caglar¹ (GRAD), Dibash Das¹, James A. Borowiec², Anjana Saxena¹ ¹Department of Biology, Brooklyn College, New York, NY, 11210 ²Department of Biochemistry, New York University School of Medicine, New York, NY 10016

Nucleolin is a multifunctional abundant nucleolar protein and its gene expression is transactivated by the proto-oncogene *c-myc* during exponential cellular growth. This non-ribosomal protein is a major nucleolar phosphoprotein which is involved in ribosomal RNA processing, RNA polymerase I-catalyzed transcription, and the regulation of apoptosis, demonstrating both positive and negative effects on cell proliferation. During an unperturbed cell-cycle, interphase (CK2) and mitotic (Cdc2) kinases regulate nucleolin phosphorylation, modulating its function and sub-nuclear localization. *We have previously demonstrated that nucleolin binds to the p53-antagonist Hdm2, inhibits Hdm2-mediated degradation of p53 and causes p53-mediated apoptosis in an ARF-independent manner.* Here we further dissect role/s of nucleolin phosphorylation in regulating the ARF/p53 tumor suppressor checkpoint pathway. We have engineered human osteocarcinoma cells that induce expression of ARF and/or nucleolin-WT (wild-type) or -S6A (with mutation at CK2 phosphorylation sites) by two distinct promoters. We found that increased levels of nucleolin-S6A significantly decreased ARF protein levels as compared to nucleolin-WT. Nucleolin-S6A was significantly more nucleoplasmic and, interestingly, cells that express S6A lacked nucleolar ARF expression. Although a dramatic loss in both ARF and p21 protein levels is evident with nucleolin-S6A expression, there was a net increase in p53 levels. Significantly, nucleolin-S6A expression caused an increase in the fraction of G1 cells in an ARF-independent manner. Thus, reduction of nucleolin phosphorylation by CK2 acts as a molecular switch causing the sub-nuclear re-localization of both nucleolin and ARF. These events lead to p53 activation, and the control of growth in both normal and stressed cells.

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BIO – 35 DO HUMANS AND THEIR HOUSEHOLD PETS SHARE THE SAME GERMS?

Camillia Monestime (UN), Aisha Dorta (UN) and Dimtry Y. Brogun, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

Germs can potentially grow on various surfaces including the epithelia of the oral cavity. The aim of this study is to compare whether the household pets and their owners are sharing the same type of germs based on the colony morphology. Samples were collected from three subjects: the human, domestic cat and dog. Growth of the bacterial colonies was accessed based on the colony size, shape, color and density. Results gathered from our experiments will help to get a closer approximation of what type of bacteria is cultivating on the surface of our oral cavity as well as the oral cavities of our household pets.

BIO – 36 RESVERATROL'S AFFECT ON THE LIFE CYCLE OF DROSOPHILA MELANGASTER

Nikole Isakovan (HS), Science research, Abraham Lincoln High School, Brooklyn, NY 11235

There have been multiple studies that have shown how resveratrol helped extend life span and health of laboratory mice. This project is an attempt to determine if resveratrol, when ingested by fruit flies, effects the life cycle of the flies. These fruit flies are chosen for experimentation because they have a mutation that does not allow them to fly, without affecting any other aspect of their genome. The flies were put in culture vials to produce adults for the experiment.

The control groups were vials that had one part fly medium, one part water, and a pinch of yeast. The experimental vials were prepared the same as the control with an added amount of resveratrol. In the beginning 160 mg of resveratrol was used, those were terminated because it seemed to be a toxic amount for the flies. The later ones only had 80 mg or the supplement, with this amount the flies are doing well and thriving in the environment.

BIO – 37 THE EFFECT OF DIFFERENT TEMPERATURES ON THE EFFECTIVENESS OF AN ANTIBIOTIC

Philip Pistraya (HS), James Madison High School

Escherichia coli is a type of bacteria that exists in animals and humans. Organisms such as humans can get this bacterium, which is also known as E. coli. E. coli is a bacterium that is present in the intestinal tracts of humans and other warm-blooded animals. These bacterium and many more can be both harmful and beneficial. The bacteria can help the body fight off sicknesses, break down and digest the food, help keep the skin clean and many more positive things. But, bacteria can be harmful because they can cause serious infections that can lead to death. In this study, we were determining the effectiveness of an antibiotic at various temperatures. E. coli will be present in the experiment of seeing whether temperature has an effect on how antibiotics kill the growth of the bacteria. In each petri dish, there was the same type of antibiotic disk that was used. The temperatures consisted of 20-25 degrees Celsius which is approximately room temperature, 37 degrees Celsius which was average human body temperature, and 42 degrees Celsius.

The materials used were petri dishes, agar, E. coli, thermometer, incubators, inoculation loops, and antibiotic disks. For each temperature, three petri dishes were used. It is anticipated that bacterial growth is best at lowest temperatures because E. coli is Psychrophilic bacteria and this bacteria grows best in low temperatures, such as 0-20 degrees Celsius.

BIO – 38 WHAT CAUSES FUSION DEFECTS IN SEXUAL FUSION? USING CHLAMYDOMONAS TO EVALUATE THE GENE (S) REQUIRED

Arwa Gabr (UN), Akil Hutchinson (UN) and Charlene L. Forest, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

Chlamydomonas reinhardtii is a single celled green alga used as a model organism to understand sexual fusion. We have been working with fusion-defective conditional mutants and insertional mutants (they can recognize each other and adhere, but cannot fuse). *GCS1*, a gene found in cells of many lower eukaryotic, is thought to be required for gamete fusion. Our goal is to determine if *GCS1* is the only gene required for fusion of gametes. Our fusion-defective mutants are being studied to determine whether they re-exhibit wild type behavior (are complemented) by transforming mutants with a Bacterial Artificial Chromosome (BAC 2F16) containing the *GCS1* gene and plasmid pHyg3. If a mutant was complemented, it should be able to fuse; such a result would lead to the conclusion that the mutant was in fact defective within the *GCS1* gene. Until now, about half of our fusion defective mutants have been complemented. To determine the gene mutated in strains that cannot be complemented by *GCS1*, SiteFinding PCR is used to determine the region in the genome where plasmid that produced the mutation is inserted. We are running SiteFinding experiments with insertional mutant 2-29 which could not be complemented. The point mutant, RK, has not shown complementation but is being co-transformed along with mutant 1-23 (which has been complemented) to insure accuracy of experiments. These experiments should help us understand the gene (s) responsible in gametes fusion.

This work was supported by a grant from the Eunice Kennedy Shriver National Institute of Child Health & Human Development (NIH) and the LSAMP program.

BIO – 39 MOLECULAR CHARACTERIZATION OF *CHLAMYDOMONAS REINHARDTII* MUTANTS TO ANALYZE GENES / PROTEINS AFFECTING GAMETE FUSION

Ting-Yi Lai (GRAD), Rina Shrestha, Sandra Ospina, Christina Savchik, Natasha LaMont, Ananya Das and Charlene L. Forest, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

We are using conditional and insertional mutants of *Chlamydomonas reinhardtii* previously isolated in our lab to discover genes/proteins necessary for gamete fusion. In order to observe whether the *GCS1* gene (a gene others have shown is involved in gamete fusion) is functional in our mutants, we performed transformations with a modified Bacterial Artificial Chromosome (BAC 2F16) and co-transformations with standard BAC 2F16 plus plasmid pHyg3 to complement our mutants. Both BACs contain the wild type version of *GCS1*. We have complemented about half of our mutants with *GCS1*. SiteFinding-PCR (which allows us to locate the site of insertion for insertional mutants) was then used for mutants not complemented with *GCS1*. SiteFinding-PCR has been done for mutants clones 5, 1-25, 2-23 and 2-25; PCR products were sequenced. Blasting the results from clones 5, 2-23 and 2-25 on the JGI Genome Portal *Chlamydomonas* database showed the inserts are in chromosome 13 in a transposon, between a GTPase and a protein with a carboxypeptidase domain. We are complementing these mutants using BAC 39B22 containing the transposon and BACs 29N17 and 33A3 containing the transposon plus several other genes. We are also working with conditional mutants *gam-1* and *gam-10* and point mutant RK, to analyze their phenotypes and complement them with BACs. Our results indicate that there is more than one gene controlling gamete fusion in *Chlamydomonas*. Determination of the gene(s) required for gamete fusion, will help us understand the mechanism of gamete fusion in *Chlamydomonas* and possibly in higher organisms such as human.

This work was supported by a grant from the Eunice Kennedy Shriver National Institute of Child Health & Human Development (NIH).

HNS – 1 THE EFFECT OF VITAMIN D ON THE DEVELOPMENT OF BONE AND ADIPOSE TISSUE IN YOUNG FEMALE RATS

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Increase in body weight has been associated with greater bone density; however recent studies suggest that obese individuals demonstrate a low bone mass and area. Other studies show a negative correlation between adipose tissue and the level of vitamin D in the serum. To investigate the effect of Vitamin D on the formation of bone and adipose tissue. One month old female weanling Sprague Dawley rats ($N=32$) were fed ad-lib for 6 weeks. They were divided into 4 groups: (1) high fat vitamin

D-supplemented group [HFD], (2) high fat vitamin D-depleted diet [HFN], (3) low fat vitamin D-supplemented group [LFD] which was our control group, and (4) low fat vitamin D-depleted group [LFN]. The high fat diets [HF] consisted of 60% kcal as fat, 20% kcal as carb, and 20% of kcal as protein, whereas the low fat diets were composed of 15% kcal as fat, 65% of kcal as carb, and 20% of kcal as protein. The vitamin D deficient diets were supplemented with calcium and phosphate to prevent hypocalcaemia. All diets were supplemented with lactose (19% of kcal) to promote calcium absorption. Body weights and trabecular values were not significantly different amongst diet groups. HF group showed more mature plate-like bone structure (low SMI) whereas the LF was rod-like (high SMI). HFN had the more % body fat, bigger fat cells and more lipids in their liver than the HFD. Vitamin D appeared to have no effect on bone formation. However, vitamin D deficiency promoted fatty liver and fat cell enlargement when a HF diet was consumed.

HNS – 2 THE EFFECT OF DIETARY FAT ON CARBOHYDRATE RESPONSE ELEMENT BINDING PROTEIN IN A RAT MODEL OF FATTY LIVER AND INSULIN RESISTANCE

Yu-Fu Kuo (GRAD), Marianna Harper, Ashley Henry, Kenneth Axen, Kathleen Axen, Department of Health and Nutrition Science, Brooklyn College-CUNY, Brooklyn, NY 11210

Obesity is highly associated with insulin resistance and Non-Alcoholic Fatty Liver Disease (NAFLD). Excessive accumulations of lipid in liver and insulin resistance are major characteristics of NAFLD. Carbohydrate response element binding protein (ChREBP) recently emerged as a key component in the process that converts excess carbohydrate to triglyceride by de novo lipogenesis pathway. ChREBP, which is activated by glucose, induces glycolytic and lipogenic gene expression by its movement between cytosol (inactive) and nuclear (active) compartments. We investigated the effect of diet-induced obesity on the amount of ChREBP and its localization. Twenty male Sprague-Dawley rats were divided into two groups: low fat group (LF group, n=12, carbohydrate 55%, fat 15%, protein 30% of calories) and high fat group (HF group, n=8, carbohydrate 19% (sucrose=5% and starch 14%), fat 55%, protein 26% of calories). The two groups remained on their respective diets for eight weeks. After eight weeks, liver samples were collected, homogenized, and separated into cytoplasmic and nuclear fractions. ChREBP expression was detected by immunoblot assay in both fractions and total homogenates. Preliminary results showed that the amounts of ChREBP in the high fat group increased more than in the low fat group after a glucose load. This means that the rats in high fat group would be more likely to synthesize fat after carbohydrate consumption. Supported by GIP and MARC

HNS – 3 DETERMINATION OF HEART RATE VARIABILITY USING AN ELECTRONIC STETHOSCOPE

Francisca G. Onyiuke (HS) and **Mercy E. Palomeque** (HS); Midwood High School, Brooklyn, NY, SUNY Downstate Medical Center University Hospital; Department of Cardiovascular Medicine

The objective of this study is to determine the feasibility and significance of determining HRV from heart sounds recorded with an electronic stethoscope. Specific aims are to determine normative reference values for short term HRV measures from heart sounds and to compare HRV measures determined from heart sounds with measures obtained by conventional electrocardiographic recording. 18 healthy subjects and 32 patients with cardiovascular risk factors/diseases were studied. All patients were surveyed as approved by the international review board. For 2 to 5 minutes, heart sound recordings of s1 to s2 cardiac time intervals (the time of mechanic diastole) were recorded using an electronic stethoscope in analogous with electrocardiogram recordings. The stethoscope consists of a conventional stethoscope design equipped with an electromagnetic diaphragm, loud speaker drivers located at the ear tips, and a lightweight analog recorder located at the junction of the single tubing to the double tubing. The system directly records sounds to a laptop which can be uploaded and displayed as waveforms (dell computer corp; round rock, TX). The signal is processed through the computer's sound card.

Data obtained from the laptop were transferred into plain text and then into software that analyzed the variables used to obtain HRV. The results obtained from the electronic stethoscope were compared to conventional measures of HRV obtained with electrocardiography. Using a linear regression and a

band Altman plot, we demonstrated our result, that the electronic stethoscope can determine HRV as efficiently as the EKG. In this regard, HRV assessed with an electronic stethoscope appears to be a quantitative extension of cardiac auscultation, one of the central features of the physical examination. This study suggests great potential of electronic stethoscopes for determining HRV. Other advantages are its portability, low cost, and availability for serial evaluations and in colonies where electrocardiography telemetry monitoring is less readily available.

HNS – 4 THE EFFECT OF OBESITY AND DIETARY FAT ON HEPATIC AMP-ACTIVATED KINASE ACTIVITY IN A RAT MODEL OF FATTY LIVER AND INSULIN RESISTANCE

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AMP-activated kinase (AMPK), a sensor of systemic and cellular energy, uses nutritional and hormonal signals to balance energy demands with energy supply. Due to its role in maintaining energy balance, dysregulation of AMPK activity may lead to metabolic disorders associated with obesity and insulin resistance. The aim of this study is to examine the impact of the following three factors on the activity of hepatic AMP-activated kinase (AMPK) in Sprague-Dawley (SD) rats: diet-induced obesity, high-fat diet (HFD), and calorie restriction. The experiment is conducted in two phases (I and II). Phase I. Twelve male SD rats were fed ad libitum on a low-fat diet (LFD) (15% fat, 55% carbohydrate) for eight weeks, while eight male SD rats were fed ad libitum on a high-fat diet (HFD) (55% fat, 19% carbohydrates) for the same period.

Phase II. SD male rats were rendered obese by ad libitum feeding on a high fat (55% kcal) diet for eight weeks. At week nine, the animals were divided into three weight-matched, pair-fed groups, with each group receiving only 65% of their ad libitum caloric intake in order to produce weight loss. Group 1 (HFR) received the original HF diet, group 2 (VLC) received a 60% fat, 5% carbohydrate diet, and group 3 (HC) received a 15% fat, 55% carbohydrate diet.

Evaluation of AMPK activity in liver lysates prepared from animals representing all diet groups will be performed by immunoblot assays. Preliminary results indicate that high fat diets blunt the activity of AMPK.

Supported by GIP and MARC

HNS – 5 COMPARISON OF LARD VS. PRIMEX HIGH FAT DIET EFFECTS ON INSULIN RESISTANCE IN SPRAGUE-DAWLEY RATS

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Do types of fat sources in diets affect the mechanism or occurrence of insulin resistance? Two high-fat diets with different sources of fat were used: a lard based diet was compared with a primex based diet. The lard based diet consisted of saturated fat while the primex based diet consisted of partially hydrogenated unsaturated vegetable oils. Both high-fat diets had the same percentage of calories provided by macronutrients (15% protein, 30% carbohydrate and 55% fat). Adult male Sprague-Dawley rats were divided into four diet groups: (1) high carbohydrate low-fat lard based, (2) high fat lard based, (3) high carbohydrate low-fat primex based and (4) high fat primex base; the low-fat groups served as normal controls for the assessment of obesity and insulin resistance. Each group of rats was fed its respective diet ad libitum for 8 weeks while food intake and weight were measured semi-weekly. Insulin tolerance tests (1 IU of insulin/kg body weight) and glucose tolerance tests (1 g glucose/kg body weight) were done to evaluate the state of insulin resistance. Dissection of epididymal, mesenteric, retroperitoneal, omental and subcutaneous fat pads were used to assess the degree of obesity. The results showed that the lard based high-fat diet was more effective than the primex high-fat diet in producing insulin resistance, while the primex high fat diet was more effective in producing obesity (defined as the increase in percent body fat).

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HNS – 6 THE PHENOTYPIC EFFECTS OF HFE ON INTESTINAL IRON ABSORPTION

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Hereditary hemochromatosis is characterized by iron accumulation in vital tissues including liver leading to organ failure. Hepcidin, a peptide hormone which interrupts intestinal iron absorption, function and regulation is disrupted in HFE-associated hemochromatosis. How dysregulation of hepcidin by HFE increases duodenal iron absorption is the focus of this project. To examine this problem, we employed a mouse model of hemochromatosis: *Hfe*^{-/-} “knockout” mice. One aspect of this study was to explore how diet affects DMT-1 activity through phenotypic features of hemochromatosis. After weaning, *Hfe* knockout (*Hfe*^{-/-}) and wild type (*Hfe*^{+/+}) mice were given an iron-deficient, basal or iron-overload diet for five weeks. After this period body weight, hematocrit, liver non-heme iron, and serum iron levels were measured. The results showed that the iron-overload diet decreased body weight ($P < 0.05$); however, body weight did not vary between genotypes. Hematocrit significantly differed between genotype and diet groups ($P < 0.05$) and revealed that both iron-deficient and iron-overload diets produced anemia in mice. The liver was significantly loaded with iron in overload diet ($P < 0.05$) compared to basal and iron-deficient diets, and *Hfe*^{-/-} mice showed greater iron accumulation than *Hfe*^{+/+} mice in all diet groups. This information will help understand the role of *Hfe* on iron homeostasis in a molecular level, furthering research on hemochromatosis. Supported by NIH/NIGMS MARC Grant GM008078

ENV- 1 BIOGEOCHEMISTRY WITHIN A STORMWATER CAPTURE SYSTEM THE SIMS METAL RECYCLING SITE IN BRONX, NY

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The stormwater capture system at the SIMS Hugo Neu metal recycling site, designed and constructed by the Gaia Institute, intercepts annually about 6.4 million gallons of runoff containing metals, hydrocarbons, and suspended solids from the 6.4 acre site, a portion of which used to flow directly into the Bronx River. Post construction, stormwater is filtered through soil horizons, prior to entering a man-made aquifer consisting of an array of StormChambers and gravel sitting above the groundwater, which discharges into the Bronx River. Apart from water capture efficiency, nutrient cycles and fate of contaminants are critical issues. Study is being conducted to examine partitioning of nutrients and pollutants within the biogeochemical systems operative in developing soil horizons. Nutrients such as N, P and K are intercepted, utilized and recycled by growing plants, while the mobility of toxic metals could be controlled by many different processes in the system. Water chemistry changes in the StormChambers, as well as those for groundwater, will be closely monitored following a storm event. Long term trends of water and soil quality changes are equally important to understand. This study will provide the first such data about the structure and development of stormwater management systems that are rapidly becoming common in urban areas. Understanding of the biogeochemical systems within the soil horizon may help to identify parameters to maximize water infiltration, contaminant capture, and nutrient utilization. These will lead to better design of engineered soil horizons for stormwater capture systems.

ENV – 2 Trace Element Concentrations in Dentine and Enamel in Shark Teeth

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Trace element concentration in shark teeth may be useful in distinguishing an individual shark's diets, habitats, and life history. This information can be useful to conservation and management of individual shark species especially in the wake of the rapidly expanding exploitation of shark populations' worldwide due to commercial fishing. This study aims to develop a framework to compare sharks from pelagic, inshore and coastal environments to determine the effects of behavior and habitat on trace element concentration in tooth dentine and enamel. Samples were collected from coastal to oceanic shark species: *Galeocerdo Cuvier* (Tiger shark), *Carcharhinus Limbatus* (Black Tip), *Carcharias Taurus* (Sand Tiger) , and *Prionace glauca* (Blue Shark). Trace element concentrations of dentine and enamel were analyzed using the ICP-MS housed at ESAC (Environmental Sciences Analytical Center) at Brooklyn College. The average concentration ranges (ppm) for each species measured so far are; REE, U, Ce, La, Ho, Eu (<1); transition elements Ba, Ni, Mn, V, (10's) Al, Zn, Cu (10's-100's), and Sr (100's-1000's). In some cases, these results mirror ranges measured by Kohn et al (1999)². In addition to the work proposed above we intend to develop a chemical means of detecting, and perhaps circumventing, changes in trace metal concentration of fossil shark teeth that occur during rock formation long after an animal's death. Success in this endeavor is of great relevance to geologists because it will provide a basis for generating reliable geologic ages for fossil shark teeth, the most abundant vertebrate skeletal material present in the rock record. Supported by: CUNY Brooklyn College GIP Award Fall 2011

ENV – 3 FINGERPRINTING POTTERY WITH X-RAY FLUORESCENCE CHEMISTRY

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Chemical and isotopic signatures have been widely used to provenience geological and archeological materials. Traditionally, wet chemistry analysis was performed to obtain compositional information. XRF-based methods are advantageous due to their non-destructive nature and rapid data collection. Scans can be performed on various spots of an artifact for validation. This study uses a portable XRF

Environmental Analyzer to examine 18th century pottery found at City Hall Park of New York City, and Raeren stoneware that is known to originate from Germany. It is reasonable to assume that there were only limited producers of such potteries during that period. Therefore, the clay likely can be traced back to a few sources. Three types of surfaces were analyzed: unglazed surfaces likely reflect the composition of the clay; glazed surfaces suggest the salt used; while the ink is known to be a different material that often contains heavy metals that produce color. Rb-Sr ratios appear to be a reliable parameter to distinguish stoneware originated from New York City or Germany. Samples from NYC, Unglazed (n=11) surfaces gave Rb-Sr of 1.54 ± 0.16 , while glazed surfaces (n=11) and the ink (n=19) this ratio is 1.28 ± 0.16 and 0.56 ± 0.28 , respectively. In samples from Germany (n=3), both unglazed and glazed surfaces showed Rb-Sr ratios less than 1. Our preliminary results indicate that chemistry data obtained by portable XRF scanner may be a promising tool for the provenience of potteries. There are many collections that can potentially be scanned, and a database can be established without involving high cost.

ENV – 4 MYCOBACTERIOPHAGE BROOKLYN

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The Phage Hunters Workshop is a research project with the main goal of finding phages that can attack *Mycobacterium smegmatis*. *Mycobacterium tuberculosis*, the organism that causes tuberculosis in human currently effects 1/3 of world population and causes millions of death annually. Finding a mycobacteriophage that attacks *M. tuberculosis* may yield new biomedical methods for dealing with antibiotic-resistant tuberculosis. Non-pathogenic *M. smegmatis* is a close relative of pathogenic *M. tuberculosis*. *M. smegmatis* was used as a preliminary screening organism during the workshop. Mycobacteria are relatively abundant in organic-rich soil and water. Soil samples were collected from Prospect Park, Marine Park, and on Brooklyn College campus, New York; GPS coordinates and detailed records of landmarks were documented. Samples were tested for mycobacteriophages by adding soil samples to growing bacteria cultures, then after an incubation period adding media filtrates to *M. smegmatis* cultures embedded in agar to detect for phages. A lytic phage named Brooklyn was isolated from Marine Park marsh soil sample, 40.60174N, 73.93079W. The phage was purified using serial dilution; the high titer lysate concentration was over 1×10^{10} PFU/mL. Phage Brooklyn DNA was extracted, digested with endonucleases for RFLP analysis; initial results indicated that Brooklyn is a member of A2 mycobacteriophage cluster. Phage Brooklyn was partially sequenced and resolved to 9 contigs. The two largest contigs (20 kbp, 13 kbp) show close sequence similarity to Phage D29, a member of the A2 mycobacteriophage cluster.

ENV – 5 REVISITING LEAD IN NEW YORK CITY TAP WATER

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Lead in drinking water still remains as one of the most serious concerns to the United States population. Even at levels lower than the current EPA standard of 15 ppb, strong evidence suggests the link between lead in drinking water and children's health. Two rounds of tap water lead surveys were conducted in 2008 and in 2010. For each survey, approximately 100 samples were collected by residents throughout the five boroughs. The survey from 2008 showed that although all the second draw samples meet the EPA standard for lead, a majority of the first draw samples exceeded this limit. Many other elements such as Cu, Sn, and Mn also showed elevated concentrations. The results indicated the necessity of flushing the water system by running the tap for 1-2 minutes before use. Using the survey from 2010, we examined the effects of physical filtration on reducing lead and examined the characteristics of suspended particulates using SEM. Most particles are amorphous depositions of compounds, usually ranging from 1-9 microns, or diatoms, ranging from 15-30 microns. These diatoms have recognizable siliceous structures that can act as carriers of lead and other heavy metals. Approximately 5% of the homes surveyed in 2010, had filters for their tap water. Our results

show that physical filtration alone can significantly reduce particulate concentrations. However, filters with large pore sizes (5 microns) may not always be effective in capturing small lead particulates.

ENV – 6 HYDROGENATION OF AROMATIC COMPOUNDS BY METAL NANOPARTICLES ON MAGNESIUM OXIDE

Reena Rahi (GRAD) and Roberto A. Sanchez-DeIgado, Brooklyn College and The Graduate Center, The City University of New York (CUNY), Environmental Sciences Analytical Center (ESAC)

Petroleum-derived transportation fuels are a major source of sulfur and nitrogen emissions in the environment. Catalytic hydrogenation is a useful method to reduce the aromatics, as well as to remove sulfur and nitrogen from fossil fuels through hydrodesulfurization and hydrodenitrogenation. However, current technologies are unable to achieve the required lower levels of these compounds.

We have synthesized nano-structured catalysts composed of Ni and Pd particles immobilized on basic supports (e.g. PVPy, and MgO) particularly suited for the heterolytic splitting of hydrogen and ionic hydrogenation mechanisms. Characterization was performed by Transmission Electron Microscopy (TEM) and Powder X-ray Diffraction (PXRD). All the new materials catalyze the hydrogenation of quinoline under moderate conditions.

ENV – 7 THE USE OF THE EARTHWORM *EISENIA FETIDA* AS FEED FOR THE FISH, TILAPIA

Jorge L. Cubas (UN), Robert Dickie, Brett F. Branco and Martin P. Schreibman Department of Biology, AREAC, Brooklyn College, Brooklyn, NY 11210

Research of alternative feeds has become a major focus in aquaculture research as the use of fishmeal is proving unsustainable. While the Institute of Food and Agricultural Sciences characterizes fishmeal as being generally produced from “small marine fish...usually deemed not suitable for direct human consumption,” these fish account for 37% of the total global marine landings, which are threatening the ecosystems surrounding these fisheries (Alder).

Eisenia Foetida, a composting earthworm, has received attention as a novel fish feed due to its ease of culture. A percentage of compostable waste-mass translates to a worm biomass that can be utilized as a dried feed. This process would reduce the cost of production and further the sustainability of an aquaculture system.

An alternative feed pellet will be developed to essentially replace the fishmeal component in commercially available feeds with processed earthworm protein and its viability will be assessed for the fish, Nile Tilapia *Oreochromis nilotica*. Four groups will be fed incremental percentages of the worm feed (0%, 25%, 50%, 75%), assessed for growth, and digestibility every two weeks for 2 months after which, a whole carcass lipid content (WCLC) analysis will be performed. A vermiculture unit is being maintained and its efficiency in supplying the worm protein will be determined. (Supported, in part by an award to MPS from the Post 50th Alumni of Brooklyn College)

ENV – 8 DETERMINATION OF WATER QUALITY AT WASTE WATER TREATMENT PLANTS THAT DISCHARGE INTO JAMAICA BAY, NEW YORK

Jessica Dasch (UN), Lisa Beausoliel and Martin P. Schreibman, Department of Biology, AREAC, Brooklyn College, Brooklyn, NY 11210

There are four water treatment facilities that discharge four hundred and twenty million gallons of treated water into the Jamaica Bay each day. Rain runoff from pavement and roads is combined with and treated with the sewage. If there is more than a half inch of rain, the water combined with the sewage is pumped into the bay without being adequately treated. This untreated water could contain pathogenic coliform bacteria. The objective of this experiment is to test the discharge water in proximity of waste water plants. The two sites with combined sewage outflows that were tested to see if rain events affect the quality of the sewage treatment were Hendrix Creek and the Paddergat inlet. Surface water samples were collected and brought back to the AREAC laboratory to be tested on M Endo and M Fc agar by membrane filtration methods. These agars test for *Escherichia coli*, *Enterobacter aerogenes*, and *Salmonella typhimurium*. *Salmonella* was identified at both sites every time. *Enterobacter aerogenes* and *Escherichia coli* were also present at all times but their numbers elevated numbers on March 11, 2011. There was a steady rain for 2 days before this collection. We

continue to monitor water quality at these sites and evaluate our results in the light of related weather events.

(We appreciate the technical support and advice from Dr. Mark Ringenary, water quality specialist for the US National Park Service. Supported, in part by an award to MPS from the Post 50th Alumni of Brooklyn College)

ENV – 9 THE EFFECT OF GRAVEL ON *PROCAMBARUS CLARKII* SPATIAL EXPLORATION

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Spatial memory is an important aspect of navigation systems in animals and manmade systems. Previous research (Basil & Sandeman, 2001) demonstrated tactile spatial memory in a memory task in Australian crayfish *Cherax destructor*. Our project aimed to determine whether American crayfish showed similar spatial memory mechanisms. We used different maze substrates and the same maze configurations as Basil's and Sandeman. The red swamp crayfish (*Procambarus clarkii*). One hypothesis was that a decrease in total distance traveled meant that the crayfish exploring its new surroundings. Another was, when a crayfish is on gravel, it will move with a faster velocity than it would on a flat surface because it wasn't slipping unlike on the smooth area. Lastly, another hypothesis was, when places in an arena with gravel, the crayfish will make fewer stops than in the non-gravel trials. It was expected that a crayfish placed in the same type of environment many times would eventually venture less because it knew its surroundings well by referring to the obstacles of the maze. The subjects were placed in a dark environment and were compelled to use tactile learning. They were placed in the same maze configuration for four trials but in the last trial, they were placed in a different maze configuration. The results refute the distance and velocity hypotheses but support the hypothesis about the number of stops. The conclusion is that there is no evidence if the crayfish are learning the spatial configuration of their environment. However, the experiment supports that gravel facilitates with exploring because the crayfish placed in a maze with gravel traveled more than the crayfish placed in a smooth-surfaced maze.

ENV – 10 ANALYZING THE TRENDS OF WATER QUALITY INDICATORS IN JAMAICA BAY, NY

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Jamaica Bay is a eutrophic, shallow, coastal lagoon that receives 90% of its nitrogen from Waste Water Treatment Facilities (WWTF). Various organizations have collected water quality monitoring data in the Bay with varying spatial resolution and temporal frequency and duration. We have begun an in depth analyses of these existing data to identify significant trends in and relationships between variables. Preliminary results focus on the summer monitoring conducted by the National Park Service at 13 stations from 2001 to 2009. On the annual timescale, there is a significant increase in nitrate concentration driven by increases at poorly-mixed stations in proximity to WWTF outfalls. In 2007, there was a significant negative correlation at the weekly timescale between chlorophyll-a and orthophosphate averaging over all stations. This trend is absent when grouping data at the annual timescale, and the relationship between nitrate and chlorophyll-a is not significant. Our preliminary results point to the importance of analyzing long-term monitoring data in a comprehensive and timely manner for identifying trends and relationships in eutrophic systems.

ENV – 11 AGGRESSIVE SOCIAL INTERACTION AND RECOGNITION MEMORY IN CRAYFISH *PROCAMBARUS CLARKII*

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Individual recognition is a key aspect of advanced social systems in humans and many animals and is a topic of interest to biologists and psychologists. The purpose of our experiment was to determine the duration of this form of social memory in the crayfish. Karavanich and Atema (1993) demonstrated pairs of American lobsters show individual recognition with repeated encounters by decrements in the intensity of their fights. We hypothesize that the crayfish show a similar ability. The crayfish were placed in a tank for 15-minutes. The matches are recorded and then scored based on an aggression scale ranging from -3 to 5. We used inter-encounter intervals of 15-minutes, 24-hours, and 1 week. We were looking for decreases in aggression between repeated fights of the same individuals. We report here on a series of encounters between two individual crayfish. One crayfish showed higher aggression throughout the series of fights, while the other lower. The aggression of both animals decreased across encounters, suggesting these opponents remembered one another. At the one week intervals, this pattern wasn't present. Our tentative conclusion is that crayfish memory is present in a span of 24-hours. More trials are needed in this ongoing project to develop greater certainty that this memory ability is common to American lobsters and their freshwater cousins, the crayfish.

ENV – 12 BRAIN ACTIVATION AND NEUROCHEMISTRY UNDERLYING BEHAVIORAL RESPONSE TO SOCIAL AUDITORY SIGNALS IN THE PLAINFIN MIDSHIPMAN FISH

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The plainfin midshipman (*Porichthys notatus*) has two male morphs, one of which produces a long duration (> 1 min) vocalization ("hum") that serves as an advertisement call to attract females. When presented with a synthesized version of the "hum", gravid females (ripe with eggs) exhibit an unambiguous orientation and response toward the sound. Interestingly, this phonotactic response is entirely absent once the female has spawned. The goal of this study is to characterize differential brain activation and neurochemistry that underlies this robust motivated response toward an auditory social signal. Females were collected from nests and placed in an arena where an underwater speaker played back male advertisement calls. Responding females, non-responding females and quiet controls (no sound stimulus) were sacrificed and their brains labeled by immunofluorescence for tyrosine hydroxylase (TH), the rate-limiting enzyme in catecholamine production (i.e., dopamine), and cFos, an immediate-early gene that is used as a marker for neural activation. We analyzed the distribution, and colocalization of these two proteins in the posterior tuberculum (PT), and preoptic area (POA), and cFos alone in the auditory torus semicircularis (TS). In subregions of the PT, responders had significantly less cFos than non-responders. We also found a significant decrease in neural activation in responding vs. non-responding females in both the POA and TS. These findings demonstrate changes in neural activation in specific brain areas and within specific dopaminergic cell populations in motivated behavioral response to reproductive-related auditory stimuli. Support from Leonard and Claire Tow Faculty Travel Award

ENV – 13 QUANTITATIVE STUDIES DEMONSTRATE MAGNESIUM CHLORIDE IS A SAFE, EFFECTIVE "ANESTHESIA" FOR OCTOPUS BIMACULOIDES

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Cephalopods are an important class of model organisms used to study higher cognitive processes. While these animals have greatly contributed to our knowledge of perceptual, learning and basic synaptic processes our ability to investigate these processes in vivo is limited by the lack of standardized anesthetic procedures. It is further limited by an incomplete understanding of the mechanism of anesthetics currently in use. Studies have shown MgCl₂ can be used as an anesthetic that lacks adverse long-term behavioral effects. Further, signs of acute distress such as inking or jetting are notably absent during "anesthesia" induction. While these effects are documented (Andrews & Tansey, 1981) they have not been systematically or quantitatively studied. We studied the reactions of four octopuses treated with MgCl₂ in artificial sea water with 10% ethanol. We video-taped the

animals during “anesthesia” induction phase for offline analysis. From the video we describe the qualitative progression of anesthetic effects on different neural systems in the octopus during “anesthesia” induction. We quantitatively describe the reduction, suppression and restoration of respiration under this “anesthesia” using power-spectral analysis. Anesthetic onset was usually rapid, with an initial onset reaction and loss of motor function observed across trials within fifteen minutes. Our studies confirm $MgCl_2$ is a safe and reliable anesthetic for *Octopus bimaculoides* for long and short duration “anesthesia”. This preparation is inexpensive, simple, reliable, and serves to expand our understanding of invertebrate “anesthesia”, thus enhancing our capabilities to investigate the cognitive abilities of these animals.

ENV – 14 THE DISTRIBUTION OF SEROTONIN IN THE BRAIN OF A VOCAL TELEOST, *PORICHTHYS NOTATUS*, LOCALIZED THROUGH IMMUNOHISTOCHEMISTRY

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The monoamine neurotransmitter serotonin (5-HT) is involved in the regulation of sensory processing and motor behavior across vertebrate taxa. Serotonergic networks also act on and are affected by hormonal systems, including adrenal and gonadal steroids. The plainfin midshipman fish, *Porichthys notatus*, is a model for studying the neural and endocrine basis for auditory and vocal behavior. Neural pathways associated with these behaviors have been mapped and are well understood in this species. Therefore, a neuroanatomical analysis of serotonin in midshipman may shed light on its modulatory role in audition and especially mating-related vocalization. Distribution of serotonin in the midshipman brain was studied using both fluorescent and peroxidase-DAB chromogenic immunohistochemistry visualization techniques. Distribution of 5-HT-immunoreactive (-ir) neurons matched closely with data from other teleosts including the highly conserved serotonergic raphe group identified in the midbrain and hindbrain. Serotonin-containing neurons and fibers were found in the spinal cord, hindbrain, midbrain, and diencephalon, while the telencephalon only showed fiber immunoreactivity. Significantly, a number of vocal and auditory processing areas contained serotonin-ir fibers. Serotonin innervation of vocal nuclei included the vocal motor nucleus in the hindbrain-spinal cord, and the periaqueductal gray and isthmal nucleus in the midbrain. A number of auditory nuclei of the midbrain torus semicircularis showed considerable serotonin innervation, as well. Vocal-acoustic integration sites in the ventral hypothalamus, preoptic area, and the ventral telencephalon also contained labeled fibers. These data provide neuroanatomical evidence of serotonin as a modulator of vocal-acoustic circuitry and behavior.

ENV – 15 CLONING AND EXPRESSION OF A G-PROTEIN COUPLED ESTROGEN RECEPTOR IN A VOCAL TELEOST

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Male midshipman fish (*Porichthys notatus*) produce a mate call by simultaneous contraction of vocal muscles under control of a pattern generator in the brain. Previous studies have shown that the estrogen synthesizing enzyme aromatase, is abundant in vocal brain centers although these areas do not contain high expression levels of the classical estrogen receptor alpha. Additionally it has been shown that intramuscular injection of estrogen rapidly increases stimulated vocal output in this species in a time frame too fast for genomic mechanisms of action. The focus of this study was to characterize the expression of a possible receptor through which estrogen elicits its rapid effect on vocal circuitry. One candidate is the gene that codes for G-protein coupled receptor 30 (GPR30); a membrane estrogen receptor implicated in non-genomic signaling. As a first step to identify expression of GPR30 in specific brain regions, a partial cDNA for GPR30 was cloned from the brain of midshipman. Degenerate primers were designed to amplify a 413bp clone whose translated sequence is highly conserved (up to 93%) with other teleosts. Species-specific primers were used to analyze GPR30 expression in fore-, mid-, and hindbrain regions as well as in the ovary, testis, liver, sonic muscle, and sensory epithelium of the inner ear using RT-PCR. GPR30 expression was limited to the brain tissues and gonads tested. These results provide evidence for GPR30 as a candidate receptor involved in

rapid estrogen-induced modulation of vocal behavior. Future studies will identify GPR30 mRNA in specific brain nuclei via *in situ* hybridization.

ENV – 16 INTERRUPTION OF LEARNING AND RECALL IN FRESHWATER CRAYFISH (*Procambarus clarkii*)

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Crayfish can learn about the layout of their environment by exploring it, using the sensory channel of touch. As they learn the layout, their exploration (both in terms of their walking and touching objects with their sensitive first antennae) diminishes. We have demonstrated previously that 1) crayfish can learn an environment over 4 days, with only a 40 minute session in the environment each day, 2) they remember this layout for at least 24 hours, and 3) that we can block the consolidation of these memories (which requires protein translation) by cooling (anesthetizing) the entire animal. Animals cooled immediately after experiencing the environment each trial, never showed a decline in exploration (no learning) while those cooled 24 hours later did show a decline in exploration (learning, habituation). Thus some time in that 24-hour window, crayfish are consolidating their memories of space. Here we aim to identify the specific area of the brain responsible for memory consolidation. We focused our brain study on the Hemi-ellipsoid body found in the eyestalks of crayfishes, which receives input from many sensory systems and appears integrative in nature. They can be isolated and cooled, while keeping the rest of the animal warm. Again, one 40-min trial a day was performed per animal, for 4 consecutive days, using a repeated measures design (n=16). We ran 3 experiments and are continuing with a 4th. 1) Animals explored and habituated to the tank/arena as above. However, on the third day when habituation had begun, cooled the eyestalks for 20 minutes, putatively blocking re-consolidation. The animal then ran as usual on the 4th day (recall block). 2) A control group of animals had their eyestalks cooled on Day 4, 24h after trial 3 (recall control). 3) One group of animals had their eyestalks cooled immediately after every trial (learning-block). 4) Another group of animals had their eyestalks cooled 24h after each trial (learning control), after consolidation had putatively already occurred. Similar results to previous consolidation blocking experiments indicate that crayfish store their memory in the Hemi-ellipsoid body, and that both recall and learning are affected by cooling that area of the brain.

ENV – 17 ANALYZING THE DIFFERENCE IN PLANT PRODUCTION BETWEEN A NEW SPRAY AQUAPONIC SYSTEM AND A TRADITIONAL FLOOD & DRAIN AQUAPONIC SYSTEM

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Aquaponics is an ecosystem approach to food production that integrates hydroponics and aquaculture. Aquaponic food systems are recirculating systems that pump nutrient rich water derived from fish metabolic products from fish tanks into plant beds where nitrogen is absorbed by plants. The water is then returned into the fish tanks. In this experiment, two different aquaponic systems were designed, built and run for 6 weeks in an indoor laboratory to investigate the difference in plant growth within a Spray Aquaponic System (the roots are sprayed intermittently with nutrient rich water) and a Flood & Drain Aquaponic System (the roots are constantly immersed in nutrient material). Two sets of arugula, basil and pak choy were grown in each system. Stem height, root length and leaf count of the plants are determined once a week and observations made as to the relative color and health of the plants in the differing aquaponic systems. At the end of the experiment, the height of each plant will be measured again, a final leaf count taken, and the wet mass of the shoot and root systems of the plants determined. The Flood & Drain System yielded less plant growth, while the new Spray System produced greater plant growth. The fact that the Spray System weighs less (does not store water) than the Flood & Drain System and uses less water than the Flood & Drain System means it could be preferred option for rooftop gardening and farming in geographies where water is scarce. (Supported, in part by an award to MPS from the Post 50th Alumni of Brooklyn College).

ENV – 18 The Harmful Effects of Oil Spills on Marine Life and Its Solution

Katrina Downer (UN), **Mariya Klyuzner** (UN), **Seleb Pan** (UN) and Ms. Shifat Noor, Undergraduate Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

The purpose of this study is to test the effects oil has on marine life, analogous to manmade disasters such as the oil spill in the Gulf of Mexico. To test this, a model of an ecosystem was created and used as an indicator of the harmful effects of such disasters. To act as a pollutant, the tank used to model the ecosystem was exposed to an amount of mineral oil. Our hypothesis was that all organisms would eventually die because the mineral oil would coat the environment and alter the pH level to that of one in which the organisms cannot survive in. Because the mineral oil damages the cells of the seaweed as it absorbs it and the organisms depend on it as a food source, they will all eventually starve to death. Homeostasis will not be maintained as the water will acidify. Our organisms were put into the tank along with sand, rocks, and a gallon of sea water. All organisms behaved normally and the pH of the water started at 8.1. As our experiment progressed, mineral oil was added. Throughout the week, the oil coated the entire surface of the water. The living organisms decreased in movement and the pH level significantly reduced. The oil in the tank was filtered out by scooping it off the surface of the water. Many of the organisms died and showed no movement. The organisms could not survive in such an environment because the oil caused the water to acidify.

ENV – 19 CARBON DIOXIDE COMPENSATION & LOCAL TREE POPULATIONS IN BUSHWICK, BROOKLYN

Kevin Ribot (HS), **Jacob Torres** (HS), et al., Academy of Urban Planning High School, Brooklyn, New York 11237

Carbon sinks are limited within urban areas. In Brooklyn trees may be considered one of the top sinks of carbon. Compared to nearby rural and suburban areas the difference in numbers of trees to human population is visibly different particularly in underprivileged neighborhoods. Students investigated one square mile surrounding their high school campus to quantify the carbon uptake of local trees in comparison to populations. Results show that the current number of trees is sufficient to compensate for the population but given new plantings are a rare occurrence suggests this balance will not be maintained in the future.

ENV – 20 CARBON FOOTPRINTS OF COMMON FOODS

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Nearly all of our daily choices affect the amount of carbon that we contribute to the atmosphere. Given recent investigations throughout the world on each country's impact on Global Climate Change through carbon dioxide output, students investigated their personal contributions to carbon dioxide output in regards to common food choices. All students within the elective class, Urban Ecology, were given and returned a food survey which included the following items; fruits, vegetables, baked goods, and snack foods. Students were asked to identify where these items had been shipped from and investigate what mode of transport was most common for that item. Given the short growing season of the Northeastern states nearly all fruits and vegetables were imported from distances as great as 6000 miles (3728 km) therefore acting as the greatest contributors to carbon dioxide emissions contributors amongst the food stuffs investigated.

ENV – 21 THE EFFECT OF NITROGEN AND PHOSPHORUS ON ALGAE IN PROSPECT PARK LAKE

Brett F. Branco, **Wen Shan Xue** (HS), and **Carmen Mui** (HS), Department of Geology, Brooklyn College-CUNY, Brooklyn, NY 11210

The purpose of the study was to analyze the nutrients in Prospect Park Lake and to provide a better set of data for the staff members to use to maintain the lake. A similar analysis was done in 1996 and a research report was published in 1997. However, the time period for the 1996 research was only from April to November, therefore the results were incomplete. This project will complete the data set

by adding data from winter and spring. Our hypothesis is that during the summer, phosphorus concentration will increase and nitrogen concentration will decrease.

To measure the nutrient concentration, a peristaltic pump was used to retrieve water samples from the lake. The samples were then used to measure the chlorophyll and nutrient concentration using a fluorometer and a nutrient analysis, respectively. From our data and results, we clearly saw that our hypothesis was correct. Phosphorous increased and nitrogen slightly decreased as we approached warmer weather.

ENV – 22 Palynomorphs of the Clayton Formation, Southeastern Missouri, as Indicators of Time and Deposition through the K/Pg Mass Extinction Event

Natalie R. Dastas (GRAD), John A. Chamberlain Jr., Department of Earth and Environmental Sciences, Brooklyn College, CUNY, NY 11210, USA

A sequence of Late Cretaceous to Early Tertiary deposits are exposed in the southeast region of Missouri's boot-heel; the sequence is composed of three main units, the Owl Creek, Clayton and Porters Creek Formations, which contain fossil evidence in support of the K/Pg extinction event. The base of the Clayton Formation is defined by a fossiliferous coquinite containing microtektites, *Discoscaphites iris*, and *Eubaculites carinatus* which are late Masstrichtian index fossils. This research project aims to resolve the timing and deposition of the coquinite in the Clayton Formation. In particular, there are three hypotheses this research intends to investigate: 1) Does the coquinite represent reworking as a result of a megatsunami produced by the Chicxulub impact, as postulated by Campbell *et al.* (2008)¹; 2) Is the coquinite caused by reworking derived from transgressive sea level rise; 3) Did some Cretaceous fauna, for example the ammonites, survive for a time after the impact? These issues will be addressed by examining palynomorph occurrences across the K-Pg boundary at the Missouri study site with the main focus aimed towards dinoflagellate identifications. Samples have been collected systematically throughout the sequence and will also include analysis of sediment preserved within the phragmacone of the baculite and scaphite discovered at the site.

Supported by: CUNY Brooklyn College GIP Award, Spring 2011

ENV – 23 A STUDY OF ROAD SALT POLLUTION IN PROSPECT PARK

Tachny Charles, **Samantha Petit Frere** (HS), Anne Solang Leveille, **Pascale Louis** (HS), Travis McKoy, Rodney Pierre, **Rouquiattou Toure** (HS), Michael W. Magee, ITAVA High School, Brooklyn, NY 11203

Snow and ice on streets and highways pose a major threat to human life and have the potential to significantly disrupt economic activity, which, for the past 50 years, has been most commonly combated through liberal distribution of salt — sodium chloride (NaCl), the most effective and inexpensive method of deicing. However, at certain levels, NaCl becomes toxic to plants and animals. Indeed, 50.8% of woody plant species are sensitive to NaCl, which at elevated levels can create osmotic imbalances, inhibiting water absorption and reducing root growth. NaCl can also inhibit some soil bacteria, ultimately compromising soil structure and thereby inhibiting erosion control. Therefore, the negative effects of this pollutant on the surrounding environment need to be examined. To study the impact of road salt pollution in Prospect Park in Brooklyn, New York, students at ITAVA high school collected soil samples after the last major snow — and salting of the roads — of the season at two different time points approximately 6 weeks apart (Time1 & Time2). Soil samples were measured for conductivity, a proxy for salinity.

Results from Time1 indicated significantly higher concentrations of salt nearer the road than (approximately 20 m) away from the road. However, this difference disappeared in the results of Time2, indicating that salt concentrations nearer the road had dissipated considerably, reaching what are assumed to be normal levels. Since results from this one study are inconclusive, an ongoing long-term investigation into the effects of road salt pollution in Prospect Park has been suggested.

ENV – 24 MANAGING BIOWASTE IN FINLAND AND UNITED STATES

Katja T. Lazarus (UN), Environmental Studies, Brooklyn College – CUNY, Brooklyn, NY

The focus of this study is on sustainable ways to manage the organic waste and to see, if there is a difference in the methods and development of the methods between Finland and United States. The focus is on managing food scraps and yard trimmings, not including biosolids and animal manure. Explored are the sustainable methods of managing biowaste through composting, through anaerobic digestion and incinerating. The use of the Life-Cycle Assessment is incorporated to the comparison of the methods. The study also includes the effect of regulations and laws as they are important parts of the waste management.

The reason for comparing Finland and United States is, because Finland's biowaste management is quite advanced and because they have already incorporated many of these practices into their national waste law. In order to reduce the human-related emission, United States, which is one the greatest waste producers, would have a global impact, if the amount of biowaste would be reduced from ending up in landfills.

ENV – 25 NO FARM? NO PROBLEM! URBAN GROWING AND COMPOSTING USING HYDROPONICS, AQUAPONICS, VERMICULTURE AND BOKASHI.

Bienvenido Arias, Richelle Cortes (HS), Jose Francisco, Rosa Gomez (HS), Reynaldo Gonzales, Luciano, Nisi Mendez, Luis Morales (HS), and Bianca Rodriguez, Academy of Urban Planning, Brooklyn, NY 11237

To learn more about growing and decomposition cycles, our 10th grade Intro to the Urban Environment class built four indoor systems using found and recycled materials. The first two systems we built – hydroponics and aquaponics systems — were used to grow plants and vegetables without soil. These methods are faster and cheaper than soil farming and can be used to grow food in relatively small spaces. Our hydroponic systems used "ebb and flow" and "flood and drain" techniques to pump water and a nutrient solution directly to the plants' roots. Our aquaponics systems also grew plants without soil, and they supported fish life too. In these systems, the plants rest in containers on top of a fish tank with the roots hanging in the water. Special bacteria turn the fish's waste into nitrogen, which is absorbed by the plants to help them grow and to keep the tanks clean. Our other two systems focused on decomposition cycles. Vermiculture is worm farming. People can feed the worms food scraps and leaves, and then the worms' waste or "castings" are used to enrich planting soil because they are high in nutrients. Finally, our Bokashi system also decomposes food scraps using anaerobic bacteria and an air-tight container. These scraps are also used to enrich soil. Building these systems has taught us that anyone can grow their own healthy plants and vegetables without needing much space or money, and it can even be done as a small business. Supported by Brooklyn College GK-12 "City-As-Lab"

ENV – 26 SHELL MORPHOLOGY AND LIFE HABITS OF THE MODERN UNIONOID BIVALVE *PYGANODON CATARACTIS* FROM STATEN ISLAND PONDS: PALEOBIOLOGICAL IMPLICATIONS FOR THE DEVONIAN UNIONOID, *ARCHANODON CATSKILLENSIS*.

Tamara Minott (UN) and John Chamberlain, Department of Earth and Environmental Sciences, Brooklyn College – CUNY, Brooklyn, NY 11210

The goal of this study is to quantify shell morphology in *Pyganodon cataractis* as a means of gaining insight to the life history and burrowing habits. This information can be used as a key to interpreting the taxonomy, life history, and paleoecology of its ancient ancestor *Archanodon catskillensis*. Analyses indicate adductor muscles of *Pyganodon cataractis* grow at a faster rate than the shell. We interpret this to mean that increased strength is needed to aid in downward burrowing activities. The adductor muscles function to direct jets of water outward from the anterior margin of the shell to fluidize sand and enhance downward burrowing. Growth increments are correlated among individuals and show similar temporal variations. We infer that this is related to yearly variations in environmental conditions in the pond. Growth line analysis indicates that growth rates in *Archanodon* are similar to growth rates in *Pyganodon*. We infer that the response of *Archanodon* to environmental conditions is similar to that seen in the modern form. In addition, the two species have several important morphological similarities, the most important of which is the identical hinge structure. These congruencies imply that *Archanodon* is a member of the Unionoids and may be the ancestral form for this bivalve superfamily.

ENV – 27 HOW DO ARTIFICIAL SWEETENERS AFFECT THE LIFE SPAN OF DROSOPHILA MELANOTGASTER?

Kimberly M. Rutherford (HS) and **Eric Mai** (HS), New Utrecht High School, Brooklyn, NY, Abraham Lincoln High School, Brooklyn, NY 11235

This experiment was designed to determine if artificial sweeteners reduced the life span of fruit flies. A recent study conducted at the European Ramazini Foundation in Italy found an increase in lymphomas. Leukemia and other cancers in rats that were fed aspartame (an ingredient found in equal) for a lifetime compared with rats that were not. Fruit flies were used in this project because fruit flies shared with humans several basic genes which direct the growth of cells. (Herman Stella, Howard Hughes Medical Institute investigator at University). Each trial consisted of 5 culture tubes each containing a mixture of fly food and water. About 15 flies were added to each tube. One of the experimental tubes contained one gram of aspartame. A second tube contained 0.5 grams of aspartame. A third tube contained 1 gram of saccharin (an ingredient found in Sweet and Low), and a fourth tube containing 0.5 grams of saccharin. The fifth tube served as a control with no artificial sweeteners added. The flies were counted over a two week period. The number of flies surviving was recorded. After 8 trials, there appeared to be no significant difference between the numbers of flies surviving in cultures containing artificial sweeteners compared to the control cultures. Additional trials will continue using 2 grams of each artificial sweetener per vial. At this time, aspartame and saccharin do not appear to shorten the life span of *Drosophila Melanogaster*.

ENV – 28 THE IMPACT OF NUTRIENT LOADING FROM CANADA GEESE

Ellis Fronerberger (HS) and **Zechariah Phillippe** (HS), Brooklyn Academy of Science and the Environment (B.A.S.E. High School), Brooklyn, NY 11225

The goal of this project is to find out if the input of Canada goose fecal matter has a substantial affect on the eutrophication of the Prospect Park Lake. This project is being done because there was a recent gassing of dozens of geese in the Park because they were being blamed for the high increase in the eutrophication of the duck weed in the Prospect Park Lake. Just like any other organisms, geese are vital to the equilibrium of the environment and they can't just all be removed the way they were. The research project being done will show how the geese feces affect the water quality. It will also show roughly about how much of a percentage of nitrogen and phosphorus composites within the lake are actually caused by geese and not other environmental factors.

ENV – 29 PREDATOR-PREY RELATIONSHIP CHARACTERISTICS IN THE MOON SNAIL (*LUNATIA HEROS*) AND ATLANTIC SURF CLAM (*SPISULA SOLIDISSIMA*)

Christopher L. Vasquez (UN) and John Chamberlain, Department of Earth and Environmental Sciences, Brooklyn College-CUNY, Brooklyn, NY 11210

This paper deals with the predator-prey relationship between the predatory moon snail *Lunatia heros* and the Atlantic surf clam *Spisula solidissima*, and whether *Lunatia* is a size-selective predator. *Lunatia* attacks its prey by boring through the shell with its radula. Size, age, thickness, boring frequency, and boring success rates were determined for sixty seven surf clams collected randomly at Sandy Hook, NJ. Incomplete borings are not observed. *Lunatia* is always successful in boring through a shell selected for attack. Clams with shell lengths ranging from 2.4 cm to 5.4 cm show a high boring frequency. Shells with lengths below 2.4 cm and above 5.4 cm are not bored. Larger borings are associated with larger bored clams. These observations indicate that: 1) the size of predator and prey are correlated, i.e. large snails attack larger clams; 2) very small and very large clams are not attacked at all; and 3) *Lunatia* may actively select prey individuals for attack. Selectivity in choice of prey individuals could result from several factors: 1) locality of the clam in the substrate, i.e., larger clams may be living too deeply in the sediment to be accessible to *Lunatia*; 2) large clams may have shells too thick for *Lunatia* to successfully penetrate; 3) small clams may have shells too small for *Lunatia*'s foot to adequately grip in preparation for boring. The absence of boring false starts strongly suggests that *Lunatia* is using some measure of a clam's size to determine which clams can be successfully bored.

ENV – 30 IMPACT OF PARKS ON CLIMATE IN URBAN ENVIRONMENTS

Harjas S. Sahni (UN) and **Boruch Jurkowicz** (UN), CUNY Brooklyn College, Brooklyn, New York 11210

Urban areas are generally hotter than rural areas, potentially causing both environmental and health issues. We wondered if it was possible to mitigate this phenomenon by increasing the amount of vegetation and open space inside urban areas. In order to test this we studied a park in a heavily urbanized location and saw if there was a significant climactic difference between it and the surrounding area. Our findings showed that the temperature inside a park was lower than the temperature in the surrounding urban areas and the wind speeds were higher. This appears to indicate that even within heavily urban areas, parks are able to maintain cooler temperatures and are therefore an effective way to reduce heat intensity in large cities.

ENV – 31 A COMPARATIVE STUDIES OF SEEDLINGS AND HERBACEOUS VEGETATION IN LOCAL NYC PARKS

Florenal Joseph, **Farhana Pinki** (UN), **Jonathan Steinmetz** (UN), and **Sabrie Blackmond** (UN), Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

This experiment aims to conduct a comparative study of the similarities amongst species of seedlings and herbaceous vegetation of three different parks in New York City; Amersfort Park, Marine Park, Paerdegat Park. We believed all three parks would be dominated by the same species of seedlings because the parks are located in the same borough, Brooklyn, and had similar territory conditions. On average, herbaceous vegetation at Marine Park was dominated by *Convolvulus arvensis*, and herbaceous vegetation at both Amersfort Park and Paerdegat Park were dominated by *Oxalis stricta*. The close proximity of the locations of Amersfort and Paerdegat Park can be a key reason as to why they were both dominated by the *Oxalis stricta* seedling. Overall, this comparative study helps to understand the importance of seedlings and herbaceous vegetation on both the environment and on pedestrians in the parks.

ENV – 32 IMPACT OF PHYSICAL DISTURBANCES ON FRESHWATER HABITATS CAUSED BY MANKIND AND THEIR GLOBAL SOLUTIONS

Kareem Amer (UN) and Ms. Shifat Noor, Brooklyn College-CUNY, Brooklyn NY, 11220

The goal of this research is to raise awareness of the impact of physical disturbances caused by man on freshwater environments. Our research was limited to three disturbances that could be replicated with limited resources. In order to exhibit these disturbances in a freshwater habitat, an aquarium populated with freshwater fish and plants was used and three different disturbances were applied: temperature drop (as a result of greenhouse effect), oil spill, and predatory invasion. The last disturbance exemplifies the reaction of certain predatory fish which are forced to migrate based on the depletion of their prey in another environment. Each disturbance was allowed one week to take effect before a global solution was designed to correct it. After the first disturbance, the fish were given a recovery period to adapt to regular living conditions before the second disturbance. This process was repeated for all three disturbances. The techniques used to create these disturbances included manually altering water temperature, measuring the concentration of oil in the aquarium to match the concentration of an oil sheen in a freshwater habitat, and introducing a foreign species to the new habitat. Methods used to replicate the global solutions involved altering water temperature over a certain time to room temperature daily, creating amateur booms/skimmers, and removing the predatory species to imitate its migration. The results obtained demonstrate that more freshwater fish die because of oil spills and an invasion of predatory species compared to those that experience a decrease in temperature.

ENV – 33 TREES OF PROSPECT PARK, THEN AND NOW – A COUNT OF THE TREES THAT HAVE SURVIVED SINCE 1902

Joy-Anne George (HS), **Peter Ogunwale** (HS), **Kyle Roberts** (HS), **Nickeshia Rumble** (HS) and **Rasheed Webber** (HS), STAR High School BCSTEP

In 1902 Leslie Harmon Peet published Trees and Shrubs of Prospect Park, a species by species account of the trees in Prospect Park; the goal of our study is to determine how many of those trees remain over 100 years later. Based on preliminary visits during the summer of 2010, we made a hypothesis that approximately 50% of the trees that were listed in 1902 still survive. We also made a hypothesis that the ratio of surviving trees of the genus *Elmus* would be lower due to the effects of Dutch Elm Disease. We studied Peet's map and species descriptions then made visits to the area of Prospect Park from Long Meadow to the Grand Army Plaza Entrance to identify the species of trees and compare them with the map provided in the publication by Peet. We also collected additional data on the trees such as GPS location and current photographs.

This study is being funded by Brooklyn College Science and Technology Entry Program.

ENV – 34 MEASURING THE IMPACT OF CANADA GEESE IN PROSPECT PARK LAKE WATER QUALITY

William Medley (HS), Brooklyn Academy of Science and the Environment (B.A.S.E. High School), Brooklyn, NY 11225

The purpose of this project was to measure the effects of nutrients being added to Prospect Park Lake water from Canada goose poop. Samples of goose poop were collected and placed in jars to test the amount of nutrients coming from the goose poop. A pipette was used to add water extractions from the goose poop into jars filled only with Prospect Park Lake water. Three control jars only contained Prospect Park Lake water without the addition of water extractions. Fluorescence was measured to see if there was a difference in the amount of algae that grew in the jars with and without the addition of water from the goose poop jars.

ENV – 35 CYTOCHROME B SEQUENCES IDENTIFY DRIED MARINE VERTEBRATES SOLD IN CHINATOWN, NYC

Ishmael Akahoho (HS), Marcia Foster (HS) and Dr. Susan Pell, Brooklyn Botanic Garden, BASE High School, Brooklyn, NY 11225

Many marine vertebrates are classified as endangered species but up to now there has not been a conclusive and simple way of identifying the dried animals being sold in different areas of the world. We decided to investigate marine vertebrates being sold in New York City's Chinatown to determine whether the species sold there are among those listed on the International Union for Conservation of Nature (IUCN) Red list. Sequences of the Cytochrome B gene were generated for each sample that was purchased. First year data identified the seahorse species *Hippocampus trimaculatus*, *H. ingens*, and *H. algiricus*. *Hippocampus trimaculatus* and *H. ingens* are vulnerable to extinction according to the IUCN and *H. algiricus* is listed as "data deficient" because its presence on the international market is unknown. Our data proved that *H. algiricus* is traded internationally and thus it may be listed as threatened in the future. Second year data have identified samples of pipefish (Syngnathinae) and poachers (Agonidae) as well as additional samples of seahorses. This research shows that the rules for distributing threatened species internationally should be more strictly enforced.

ENV – 36 ROAD SALT POLLUTION IN PROSPECT PARK, BROOKLYN

Sean Bowen (HS), Shanice Stephenson (HS), Kareema Grant (HS), Daja Waters (HS), Aaron Shaw (HS), Lauren Washington (HS), Celeste Puac (HS), Sazin Rahim (HS), Ramon Collins (HS), and Janay Carver (HS), Science, Technology, and Research (S.T.A.R.) Early College High School at Erasmus Hall, 911 Flatbush Ave., Brooklyn, NY 11226

Prospect Park, in the heart of Brooklyn, is home to a variety of trees and wildlife that are very sensitive to ecological change. Constant human activity in the park may be contributing to the gradual deterioration of the natural habitat. This winter, Brooklyn received record amounts of snow, requiring tremendous amounts of road salt to be applied to public roads to ensure safety. Every year, this salt is left in the soil and lake at Prospect Park, and does major damage to the local ecosystem. In this study, we collected soil samples at various distances from the road running through the park, and at different times of year, to see how road salt affects our natural forest. We hypothesized that the

highest accumulations of road salt would be near the road, and that concentrations would be higher after the winter. Our preliminary results confirm our hypothesis, and suggest that the use of road salt in Prospect Park may have negative effects on the local environment.

Supported by Brooklyn College GK-12 City-as-Lab. (GK-12 Fellows: Jesse A. John and Sheila Nightingale)

ENV – 37 THE EFFECTS OF THE PETROPHYSICAL PROPERTIES OF CALCAREOUS MUDSTONES AND LIMESTONES ON CAPILLARY PRESSURE VALUES

Kieva C. Watson (UN) and Constantin Cranganu, Department of Earth and Environmental Sciences, Brooklyn College-CUNY, Brooklyn, NY 11210

Fifteen calcareous mudstone and limestone samples were selected from over one hundred and twenty sandstone, limestone and siltstone samples from the Oklahoma Panhandle. These samples were analyzed using the Auto Pore IV Mercury Intrusion Porosimeter, manufactured by Micromeritics, to examine their petrophysical properties of pressure (psia), pore radius (μm), mean radius (μm), cumulative pore volume (mL/g), incremental pore volume (mL/g) and % of total Hg intrusion volume. In this research mudstone and limestone porosities were measured and then the porosity effects on P_c , capillary pressure and P_d , displacement pressure at 10% of mercury intrusion of the rock samples were analyzed. Porosity is important especially in the petroleum industry when differentiating between different sediments and the purpose or roles in which they serve (reservoir or cap rock). From this analysis both the P_c and P_d , values were obtained graphically by drawing a tangent to the curve of the intrusion of mercury.

The current analysis of these mudstones and limestones samples serves also a larger purpose as it helps in the interpretation and prediction of the height of carbon dioxide (CO_2) retention in the already depleted gas fields of the Oklahoma Panhandle. The results of this study will be used to examine what role and how important is porosity in the carbon dioxide sequestration mitigation processes. It would highlight the retention capabilities of both the calcareous mudstones and limestones samples and how effective they may act as seals in preventing the leakage of CO_2 to adjacent layers when stored. Supported by Geology 5000 V1 Course and Earth and Environmental Sciences Department

ENV – 38 PROMOTING SUSTAINABLE URBAN AGRICULTURE IN BROWNSVILLE, BROOKLYN

Marji Parker's EATS Class (HS), Teacher's Preparatory High School

Sustainability of urbanized environments is becoming an issue of increasing importance, especially in NYC. Students at Teacher's Prep High School in Brownsville, Brooklyn have undertaken a continuing project to produce healthy food from a local garden for use by local residents within the community. Students of the EATS class have researched methods for growing food, building structures to promote high yield crops, as well as methods to curtail pests from ruining the crops.

Students have then experimented with methods of composting, including non-traditional "Bokashi" indoor composting to generate fertilizer from food scraps. Additionally, this semester students have begun to collaborate with undergraduate arts students from Parsons School of Design with the goal of creating signage for the garden, and the community as well as T-shirts to generate awareness and support for the work the class is doing. In addition, the group is working together to redesign the space within the garden in order to maximize the usable space, and increase the amount of crops that can be produced.

ENV – 39 ASTHMA AND DEMOGRAPHIC INFORMATION AT TEACHERS PREPARATORY HIGH SCHOOL

Shereen Springer's Living Environment Class (HS), Teacher's Preparatory High School

Asthma is a disease with a variety of different causes, and unfortunately afflicts many young people. In this study, students looked at self-reported asthma symptoms and diagnoses as well as demographic and FEV-1 readings from students Teachers Preparatory High School in the Brownsville neighborhood of Brooklyn. The data was used to figure out what factors influence a diagnosis of the disease. Two techniques were used to collect the data. The first was a survey instrument, and the

second was using a flow meter to collect FEV-1 readings. While much demographic data was collected and analyzed to further enforce established links between a variety of causes and a diagnosis of asthma, the FEV-1 results showed a significantly higher rate of asthma than the diagnosis of asthma reported. The unexpectedly low FEV-1 levels may be indicative of a problem with methodology and warrants further study.

PHYSICS – 1 DAISYWORLD – MODELING OF A SIMPLE SYSTEM IN WHICH QUANTITATIVE PHYSICS CAN BE APPLIED TO ENVIRONMENTAL IMPACT

Christopher Wing (UN), Micha Tomkiewicz, and Nicolas Giovambattista, Department of Physics, CUNY Brooklyn College, Brooklyn, NY 11210

Daisyworld is a mathematical model introduced by Lovelock and Watson that mimics important elements of the Earth-Sun system. The original purpose of the model was to demonstrate that feedback mechanisms can evolve from the actions or activities of self-interested organisms in the Earth; and that the planet has seemingly collective responses to geophysical changes. Using this model we expect to show that the process of natural selection is sufficient to accomplish climate regulation and stability in response to disturbances. We have implemented a spatial version of DaisyWorld (written in C-programming-language) that is based on a set of rules which incorporates a cellular automaton approach. In our model, each cell contains an albedo and temperature during a single time frame. Albedo values based on the color of the daisy grown in a specific cell, range from 0 to 1; the higher the albedo value, the higher the reflective capacity of the cell to reflect radiation. The simulation takes into account these spatial factors of temperature and albedo when making changes during time steps. The program can also allow us to simulate this process with the addition of external influences such as mutations, an increasing solar luminosity, or even introducing predators to our model. Regardless of all external disturbances we add to the system, the negative feedback characteristics will still attempt to keep the planet in homeostatic balance. The model is simple enough to allow us to calculate physical properties from first principles and try to validate them in the real world.

PHYSICS – 2 HIGH RESOLUTION TEM ANALYSIS OF THREADING DISLOCATIONS IN ALUMINUM NITRIDE EPILAYERS GROWN BY THREE-STEP METHOD

Bo Cai (GRAD), and Mim Lal Nakarmi, Department of Physics, Brooklyn College of the CUNY, Brooklyn, NY 11210

Aluminum nitride (AlN) has attracted considerable attention as a promising deep ultra violet material. Reducing dislocation density is essential to improve the material quality. We report transmission electron microscopy analysis of AlN epilayers grown on sapphire substrates by three-step growth method using metal organic chemical vapor deposition. High-resolution transmission electron microscopy revealed that most of the threading dislocations are annihilated within 300 nm. Stacking fault is greatly reduced in this method resulting very low screw type threading dislocations. Dominant dislocations are edge type dislocations.

PHYSICS – 3 SIMULATION STUDIES OF THE THERMAL AND MECHANICAL PROPERTIES OF THE ELASTIN MIMETIC PEPTIDE [LGGVG]_n

Jiaxin Huang (UN), Cheng Sun, Odingo Mitchell, Nicole Ng, Zhaona Wang and Gregory S. Boutis, Department of Physics, Brooklyn College, Brooklyn, NY 11210

We report on a molecular dynamics simulation based study of the thermal and mechanical properties of the elastin mimetic peptide [LGGVG]_n (n=3,7). Our findings indicate that this peptide undergoes hydrophobic collapse as the temperature is raised from 5°C to 60°C. This behavior is similar to what has been observed in other short mimetic peptides of elastin. Both [LGGVG]_n (n=3, 7) peptides exhibit an increase in the number of side chain contacts and peptide-peptide hydrogen bonds when the temperature is raised from 5°C to 60°C. These observations are accompanied with a decrease in the number of water molecules and number of peptide-water hydrogen bonds. This work also reports on a comparison of the dynamical, structural and entropic properties of [LGGVG]₃ and [VPGVG]₃ and quantifies the interaction with surrounding waters of hydration under mechanically strained conditions.

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PHYSICS – 4 EVIDENCE THAT WATER DOES NOT BEAR THE ENTROPIC FORCE IN THE ELASTICITY OF ELASTIN

Cheng Sun, Odingo Mitchell (GRAD) , Jiaxin Huang and Gregory S. Boutis, Department of Physics, Brooklyn College, Brooklyn, NY 11210

The elasticity of elastin is driven by a unique entropic force that is understood to be strongly correlated to the degree of hydration of the biopolymer. The contribution of water to the hydration dependent entropic force of elastin has been a long standing topic of interest and has not been experimentally studied to date. In this work, systematic NMR measurements of the correlation times of waters of hydration and the protein backbone have been performed as a function of the strain applied to the biopolymer. The experimental data indicate that the entropy of proximal waters of hydration increase while the protein backbone entropy decreases with increasing strain, which provides an experimental evidence that the waters of hydration do not bear the entropic force. Our results support a model whereby the source of elasticity arises solely from a reduction in entropy of the protein whose motion is facilitated by hydration. The experimental methods implemented in this work may aid in probing the complex hydration dependent functional properties of other biological elastomers, as well as in the development of artificial elastin.

Supported by NIH SC1 7SC1GM086268

PHYSICS – 5 MEASUREMENT OF THE EXCHANGE RATE OF WATERS OF HYDRATION IN ELASTIN BY T2 - T2 CORRELATION SPECTROSCOPY

Cheng Sun (GRAD) and Gregory S. Boutis, Brooklyn College, Brooklyn, NY 11210

We report on a direct measurement of the exchange rate of waters of hydration in elastin by T2–T2 exchange spectroscopy. The exchange rates in bovine nuchal ligament elastin and aortic elastin at temperatures near, below and at the physiological temperature are reported. Using an Inverse Laplace transform (ILT) algorithm, we are able to identify four components in the relaxation times. While three of the components are in good agreement with previous measurements that used multi-exponential fitting, the ILT algorithm distinguishes a fourth component having relaxation times close to that of free water and is identified as water between fibers. With the aid of scanning electron microscopy (SEM), a model is proposed that allows for the application of a two site exchange analysis between any two components for the determination of exchange rates between reservoirs. The results of the measurements support a model wherein the net entropy of waters of hydration should increase with increasing temperature in the inverse temperature transition.

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PHYSICS- 6 AN ANALYSIS OF POTENTIAL BREAKUP AND ORBITAL SHIFTS FOR COMET 103P/HARTLEY 2

Jakub Andrzej Karas (HS), James Madison High School, Brooklyn, NY

Comet Hartley 2 was quite recently visible in the night sky and passed close to Earth in its present orbit. The purpose of this experimental work was to examine the composition and motions of the comet using available data to determine whether this comet has the potential to break apart and if this comet poses a threat to Earth. The procedures followed included an in-depth literature search and conversations with John Pazmino, who inspired me to do further work investigating this comet. My research began with a study of the Roche limit and factors that could cause a celestial body to breakup. The calculation of this limit requires accurate estimates of the comet radius. It is a difficult task, however, with such an irregular-shaped object, therefore a range of radii from 0.21 Km to 0.57 Km was used, based on previous estimates and recent images of Hartley 2. The literature search revealed a wide range of estimates (0.2-2.0 gcm⁻³). Recent observations have proved that this comet resembles a *peanut* or *chicken leg* shape. Test of small clay peanut-shaped objects show that it was most likely to break in its narrow center area. Calculations performed provided the data which demonstrated that the comet could approach Jupiter to a distance of 2.4E10 kilometers prior to

breakup using an assumed density of 0.5gcm^{-3} . It is very unlikely, however, as shown by the orbital simulations and Hartley 2 will probably disintegrate due to loss of mass.

PHYSICS – 7 SUNSCREEN LOTION OPTICAL ANALYSIS

Majid Sahin (UN), Ali Sahin (UN), and Michael Skvasik (UN), Prof. Kai Shum, and Prof. Mim Nakarmi, Department of Physics, Brooklyn College-CUNY, Brooklyn, NY 11210

Our optical research project is about the effectiveness of sunscreen/sun block lotions. We investigated the optical transmission of a UVB source through several samples of lotion. The lotions were picked based on their SPF (Sun Protection Factor) values and active chemical ingredients. We assume with higher SPF values the lotion's effectiveness lasts longer and is more effective in protecting skin. By using a Lambda 950 VIS/UV spectrometer we measured the transmission of UV light in the range of 200-500 nm. The samples were spread onto 1 in quartz slides (quartz does not absorb in the specified range).

The results show that in the range of UVA, UVB and UVC the lotions, regardless of the SPF values or the name brand, blocked the transmission of the UV light effectively. Since the optical experiments on the material were done under laboratory conditions, the data does not apply to skin. The optical experiments were performed to verify the effectiveness of the lotions in and of themselves and to prove that the different SPF ratings given to lotions give about the same blocking effect. We also tested the time effect of the lotion's ability to block harmful UV light. The results, after leaving the lotion exposed to two hours of UV light and collecting data in intervals of ten minutes show that the lotion does not degrade quickly over time.

PHYSICS – 8 Force Distributions during Projectile Collisions

Jonathan Pinkhasov (HS) and Mr. Harvey, James Madison High School, Brooklyn, NY

It has been hypothesized that collisions of round glass objects (marbles) will show different force distributions when colliding on a flat surface or colliding when moving through the air.

The procedure followed involves the launching of marbles that were accelerated by gravity through 2 PVC tubes to create collisions in air. As a control marbles will be launched through the tubes but allowed to roll on flat surface during collisions. The data collected consisted of measurements of velocity, momentum, friction, gravity, kinetic energy.

Preliminary experiment demonstrates that the methodology followed provides uniform acceleration and it appears that the hypothesis is supported. Additional work is being performed for further results.

PHYSICS – 9 WATER-LIKE LIQUID AND GLASS ANOMALOUS PROPERTIES AND POLYAMORPHISM IN A MONOATOMIC SYSTEM

Joel Y. Abraham (UN), and Nicolas Giovambattista, Department of Physics, Brooklyn College-CUNY, Brooklyn, NY 11210

We perform molecular dynamics simulations of a system of particles interacting via a smooth, isotropic, pair potential. This model system exhibits the anomalous properties that are known to occur in liquid water. Specifically, our system exhibits: (i) expansion and (ii) increase of compressibility, κ_T (T, P), upon isobaric cooling, and (iii) increase of diffusivity upon isothermal compression. This model system also exhibits (i') density minima upon isobaric cooling, and (ii') diffusivity minima upon isothermal compression. Remarkably, we find a liquid-liquid phase transition (LLPT) and a liquid-liquid critical point as hypothesized to occur in real water. A detailed thermodynamic characterization of the LLPT and properties in the supercritical liquid domain is presented. In the glass state, our model system results in reversible polyamorphism between low- and high-density amorphous solids (LDA and HDA, respectively). It is also found that HDA results from pressure-induced amorphization of the model's low pressure crystal, as observed in water and other materials.

PHYSICS – 10 COMPARATIVE INVESTIGATION OF DEFECTS IN UNDOPED AND SI-DOPED ALUMINUM NITRIDE EPILAYERS USING AFM

Nancy Yi (UN), Matthew Griffin, Ming Jiang and Mim Nakarmi, Department of Physics, Brooklyn College- CUNY Brooklyn, NY 11210

The purpose of our experiment is to study the defects and compare their nature in undoped and Si-doped Aluminum Nitride (AlN) epilayers. Potassium Hydroxide (KOH) of 15% concentration by weight at 60°C was used to etch the surface at different time intervals. We used Atomic Force Microscopy (AFM) to observe the surface morphology on the etched surface. We found large pits of hexagonal shapes and rounded small pits as revealed by the AFM images. We will present comparative investigation of undoped and Si-doped samples.

PHYSICS – 11 PULSE NUCLEAR MAGNETIC RESONANCE INVESTIGATIONS OF LIQUID HYDROCARBONS DURING PHASE TRANSITIONS

Janet Chiu, Yul Galloway (UN), Anne Li, and Mim Nakarmi, Department of Physics, Brooklyn College-CUNY, Brooklyn, NY, 11210

3Pulse nuclear magnetic resonance (NMR) is utilized in many scientific fields to study the magnetic nuclear environments of test materials. In this presentation, we report on the results of our experiment where we examined the difference in the nuclear magnetic environment during the phase transitions of three organic hydrocarbons (petroleum jelly, butter and hair gel) by comparing their spin-spin (T_2) and spin lattice (T_1) relaxation times.

CIS – 1 A FLOCKING-BASED METHOD FOR DATA VISUALIZATION

Jonathan Chan (UN) and Elizabeth Sklar, Dept of Computer and Information Science, Brooklyn College, City University of New York, Brooklyn NY 11210

We investigate the ability of flocking algorithms to evolve self-organizing visualizations of data. Our flocking algorithm is based on the seminal work of Craig Reynolds [1987] which simulated herding animals such as flocks of birds, schools of fish, and herds of gazelles. He observed that an individual animal usually does not perceive the whole group, but rather only a localized section within its field of vision. He proposed that each animal only attempts to follow the direction of its local group, to draw towards the center of the group, and to avoid collisions with its neighbors. He constructed a computer model by programming individual agents, or "boids", to exhibit these behaviors, and he successfully produced a realistic computer simulation for flocking behavior. In our research, we have utilized Reynolds' flocking model and extended it to represent different data sets. This has been accomplished by associating with each boid a set of features from the data. Boids are programmed to flock together based on separation parameters. These separation parameters disable the attractive flocking forces for boids in dissimilar groups while enabling attractive forces between boids of similar groups. In addition, we have introduced an interactive aspect to our model -- a force point. A force point attracts boids to a certain location and can be configured to attract specific matching feature values. This is useful for allowing a user to separate out boids with specific feature values of interest.

CIS – 2 ACCURACY OF DIFFERENT RANGE SENSORS

Michael Costantino¹ (UN), Simon Parsons² and Elizabeth Sklar, Dept of Computer Science, The College of Staten Island, City University of New York, Staten Island NY 10314¹, Dept of Computer and Information Science, Brooklyn College, City University of New York, Brooklyn NY 11210²

The goal of this study is to compare the accuracy of two different robotic range sensor devices. The two sensors are: (1) a Hokuyo Aist URG laser scanner fitted on a Roomba Robot and (2) a pair of laser pointers fitted on a Blackfin Surveyor robot and read by a wireless camera. The sensors readings are compared to the actual distances, measured manually, in a circular enclosure at every 5 degrees. The percentage of error is determined. The two sensors are timed and compared to determine the most efficient sensor for practical applications. Supported by the National Science Foundation under grant #: CNS-0851901

CIS – 3 VISION-GUIDED OBSTACLE AVOIDANCE IN ROBOTS

Adiba Ishak (UN), Simon Parsons and Elizabeth Sklar, Dept of Computer and Information Science, Brooklyn College, City University of New York, Brooklyn NY 11210

Automated robots can be useful in a myriad of routine, complicated, and/or dangerous jobs. One example is the use of robots in search and rescue projects, in which robots are used to search for and assist distressed persons in areas too dangerous or inaccessible to humans. Two of the most significant challenges posed in developing autonomously operating robots are *navigation* and *collision avoidance*. Our research focuses on developing a system to detect and avoid any obstacle that the robot encounters in real-time. The chosen method employed – a vision-based system – provides the advantage of more cost-effective and accurate results than a laser or sonar-based method. Furthermore, the images taken by the robot's camera can be used to identify a particular object of interest. Vision-based obstacle avoidance was implemented on the Surveyor SRV-1 robot using C++ and OpenCV functions (Open Source Computer Vision Library) in a two-step system. For the first step, image analysis is done on the captured frames, which results in binary images highlighting the obstacles as black pixels against a white background. Additionally, the horizon is also detected using the images via statistical analysis in order to avoid collisions with walls. For the second step, information is extracted from the binary images in the form of distances to the closest obstacles in front of the robot. Using this distance information, the robot can then autonomously steer away from the sensed obstacles.

Supported by the National Science Foundation under grant #: CNS-0851901

CIS – 4 AUTONOMOUS DISTRIBUTION OF ROBOTS IN A KNOWN ENVIRONMENT

Diquan Moore¹ (UN), **Samuel Sanchez**² (UN), Simon Parsons³ and Elizabeth Sklar³, Dept of Mathematics and Computer Science, Lehman College, City University of New York, Bronx NY¹, Dept of Computer Science, Queens College, City University of New York, Flushing NY², 3Dept of Computer and Information Science, Brooklyn College, City University of New York, Brooklyn NY³

Our research involves development of algorithms that focus on the intelligent distribution of multiple robots within a given search area. The number of robots, the location of each robot, and the size of the search area must be acquired first to effectively complete the distribution task. Providing pre-constructed maps and the location of static obstacles is not necessary but does aid in this process. The purpose of being able to do this will prevent one region of the search area from being explored numerous times by different robots. Two of the immediate benefits are: decreased search time and less battery consumption. Experimental results evaluated on physical robots will be compared with running the same algorithms in simulation.

Supported by the National Science Foundation under grant #: CNS-0851901

CIS – 5 OBJECT IDENTIFICATION AND TRACKING WITHOUT COLORED MARKERS

Moses Kingston (UN), **J. Pablo Munoz** (UN), Simon Parsons and Elizabeth Sklar, Dept of Computer and Information Science, Brooklyn College, City University of New York, Brooklyn, NY

The goal of this project is to develop an overhead camera system capable of identifying and tracking the positions of a group of robots within a large arena. The purpose of this study is to give us the ability to identify each robot within a group, without the use of any additional markers. The project is built upon research done by Professor Jacky Baltes (University of Manitoba), and his team. Our project expands on his developments by increasing the size of the arena that is covered; subsequently the number of cameras needs to increase. Our system employs 6 cameras in parallel, to cover the full arena. Once this system is fully implemented, all robots, even in large teams, can be identified and tracked within the surveyed arena.

Supported by the National Science Foundation under grant #: CNS-0851901

CIS – 6 TEACHING A ROBOT USING DEMONSTRATIONS

J. Pablo Munoz (UN), **Arif T. Ozgelen** (UN) and Elizabeth Sklar, Dept of Computer and Information Science, Brooklyn College, City University of New York, Brooklyn NY 11210

We present the initial stage of our research on *Learning from Demonstration* algorithms. We have implemented an algorithm based on *Confident Execution*, one of the components of the *Confidence-Based Autonomy* algorithm developed by Chernova and Veloso. Our preliminary experiments were conducted first in simulation and then using a Sony AIBO ERS-7 robot. So far, our

robot has been able to learn crude navigation strategies, despite limited trials. We are currently working on improving our implementation by including additional features that describe more broadly the state of the agent. Our long term goal is to incorporate Learning from Demonstration techniques in our HRTeam (human/multi-robot) framework.

Supported by CUNY Collaborative Incentive Research Grant #1642.

CIS-7 IS IT POSSIBLE TO HACK A GAME MACHINE SUCH AS THE PSP (PLAY STATION PORTABLE)?

Mikhael Manasherov (HS), James Madison High School

Being fascinated with hacking the PSP, research was conducted to learn more about how to gain access to the source code conducted. After researching it was learned that you need to buy, or make a Pandora battery, a device that contains a chip preprogrammed to erase the PSP's original source code and replace it with a new source code that changes the firmware on which the PSP runs, which is the EEPROM chip. The new firmware has no restrictions because it is custom made, unlike Sony's original source code, that limit the game machine's operations. To carry on this transaction, you also need a memory stick, otherwise referred to as a magic memory stick, used at the same time with the Pandora battery. Before hacking the PSP, it is necessary to learn more about restrictions to hacking the PSP. Having the improper model of the PSP, and or having an incorrect motherboard in the machine, will damage your PSP's circuit and it will no longer work. An advantage of this process is to gain open access to the game machine and allow the user to get free games, download programs and have more freedom to explore the program.

CIS – 8 SIMULATION OF LEGO™ NXT ROBOT MOTION USING A GRAPHICAL INTERFACE

Amy Delman, **Rena Delman** (UN), Joseph Quacinella, Lawrence Goetz, Mikhail Kunin, Prof. Langsam, and Prof. Raphan, Department of Computer and Information Science, Brooklyn College-CUNY, Brooklyn, NY, 11210

The purpose of this project is to develop a graphical representation for simulating movements and trajectories of a Lego™ NXT robot. These robots are presently being used in an introductory course in programming using C/C++, which utilizes the nxtOSEK C/C++ Application Programming Interface (API). No emulator or simulator for the robot's platform environment could be found. This necessitated the development of an NXT robot simulator, which displayed variables associated with motor control, but it lacked graphical features for visualizing robot movement. The graphical simulator that has been developed will give students the opportunity to observe robot behavior before trying their programs on the NXT brick (the robot) in the laboratory. The NXT simulator was implemented in C/C++ using the GTK+ graphical library, as a graphical interface, and C++ to wrap the NXT robot's functions. Two graphical windows were implemented: One window displays a graphical image of the NXT brick and within this window are small text boxes that display the pulse-width modulated (PWM) values of each motor, corresponding to a real robot. The other window displays an icon that moves in a plane corresponding to the trajectory that would occur due to the displayed PWM values. Higher PWM values move the robot faster. Robot turns were implemented using a correlation between PWM and time to yield an angle of rotation in radians. Implementation of the trajectories induced by the changing PWM values for each motor allows students to view the robot's movement graphically and helps them debug their programs.

Supported by: NSF-CCLI grant 0633497

CIS – 9 ROBUST ALGORITHMS FOR PREDICTING TURNING AS A FUNCTION OF PULSE WIDTH MODULATION (PWM) AND DURATION IN LEGO NXT ROBOTS

Joseph Quacinella (UN), Amy Delman, Rena Delman, Larry Goetz, Yedidyah Langsam, Theodore Raphan (Mentor)

In order to develop a graphical simulator for an nxtOSEK C/C++ based system for controlling NXT robots, we have developed algorithms for making turns with two independently controlled wheels. The purpose of this study was to perform experiments which tested the algorithmic performance against that of the real Lego Mindstorms NXT robot. Programs were then downloaded to the NXT brick, whose

purpose was to have the robot make turns. Turns were implemented by setting PWM values in the motors that differentially powered the wheels for a specified duration. Initially, the wheels were symmetrically driven in opposite directions to make turns in place. In this instance, the duration for the completion of a circle was related to the PWM by a power function with empirically derived coefficients. The idealized mathematical derivation, which predicted the turns based purely on distance between the wheels, radius of wheel, PWM values and duration did not accurately predict the turns as the parameters of friction and gear slack could not be accurately modeled. This required deriving an algorithm based on an empirical process. The results of testing the robots turns against the predicted turns were more robust and consistent. The predicted turns based on the empirically based algorithm was then extended to include turns of arbitrary PWM and duration. The results favorably compared to actual robot turns. This study shows that empirically-based algorithms can be used effectively in predicting NXT turning behavior and are appropriate models for developing simulations of NXT robot behavior.

CIS – 10 ARGUMENTATION-BASED REASONING IN AGENTS WITH VARYING DEGREES OF TRUST

Simon Parsons, Yuqing Tang (GRAD), Elizabeth Sklar, Peter McBurney and Kai Cai
Department of Computer & Information Science, Brooklyn College, and Department of Computer Science, Graduate Center.

The degree to which an agent trusts other members of a multiagent system will inform what it believes, and the conclusions that it comes to when it reasons with information from other agents. Here we consider a group of agents with varying degrees of mutual trust, and examine integrating trust data with the argumentation-based reasoning process. The question we seek to answer is "What is the relationship between the trust one agent has in another and the conclusions that it can draw using information from that agent?" Here we give some initial answers.

CHEM – 1 A THERMODYNAMIC MODEL OF THE ACTIVITY CHIMERIC DRUGS

Mark N. Kobrak and Charles C. Forgy (UN), Department of Chemistry, Brooklyn College of the City University of New York, Brooklyn, NY 11210

A strategy which has become increasingly popular in recent years in the design of new drugs is the covalent linkage of two monomers into one drug. This can be done either with monomers of the same drug, creating a dimer, or different drugs, creating a chimera. A problem which has plagued this research is the lack of a rigorous mathematical model with which to compare the activity of the hybrid with its constituents. As a result, many papers have made poorly defined and on occasion debatable claims of synergy or other benefits arising from hybrid drugs.

This paper aims to create a strictly thermodynamic model of the activity of a hybrid drug relative to its monomeric constituents. This model assigns the drug a separate equilibrium constant for binding via each of its monomers to its target substrate, as well as an equilibrium constant for the simultaneous binding via both monomers to the same substrate. The model then relates the equilibrium constants to the necessary effective concentrations of each monomeric subunit, the necessary effective concentration of the hybrid, the concentration of substrate in solution, and the fraction of bound substrate. Although this model relies on testing several parameters, it leads to testable predictions as to the synergy and nature of the drug.

CHEM – 2 THE REACTION OF HYDRAZONE WITH SINGLET OXYGEN WITH AN AIM TOWARD DRUG-DELIVERY VIA THE PHOTORELEASE OF NITROSO COMPOUNDS.

Benjamin Rudshiteyn (UN), Alvaro Castillo, Aswhini Ghogare, and Alexander Greer. Department of Chemistry, Brooklyn College-CUNY, Brooklyn, NY 11210

Here, the photo oxygenation of the C=N bond of hydrazones has been studied computationally. The reaction is analogous to the reaction of singlet oxygen ($^1\Delta_g O_2$) with alkenes, in which 1O_2 can react with the hydrazones double bond via a [2 + 2] pathway to produce 1, 2, 3-dioxazetidine or via an 'ene' reaction to form an allylic hydro peroxide. The reactions were compared for a concerted path versus the stepwise formation diradical or zwitterionic intermediates. The computational data will be used to assist in developing an optical fiber with a maneuverable mini-probe tip that sparges O_2 gas and photo-detaches nitroso drug molecules. Singlet oxygen will be produced at the probe tip surface which reacts with a C=N spacer group releasing the nitroso drug upon fragmentation assuming the 1, 2, 3-dioxazetidine intermediate is formed preferentially to the hydro peroxide.

CHEM – 3 STUDIES OF POTENTIAL GOLD ANTI-CANCER AGENTS WITH BIOMOLECULAR TARGETS

Farrah Benoit (UN), Maria Contel, Monica Carreira, Department of Chemistry, Brooklyn College

Through research in an inorganic chemistry lab, I have worked on the synthesis of ligands that can be used to potentially synthesize inorganic medicinal cancer drugs. In particular, the metal we have studied is gold as alternative to currently used platinum inorganic compounds. While gold(III) is isoelectronic to Pt(II) and has also a square-planar configuration the mechanism of action of gold(III) cytotoxic agents seems to be very different from that of Pt(II) compounds. While Pt(II) derivatives bind to DNA, the biomolecular target for gold(III) compounds seems to be a different one, most plausibly mitochondria and mitochondrial proteins. This may lead to drugs with less side-effects than Pt ones. The group of Prof. Contel has prepared highly cytotoxic gold(III) complexes with iminophosphorane ligands of the type $R^1N=PR_3$.¹ These ligands confer stability to gold(III) centers while incorporating P atoms for subsequent study by ^{31}P NMR spectroscopy. We need to have ligands of this type since gold(III) complexes directly coordinated to phosphine (phosphane) ligands are not stable. The gold complexes synthesized in Contel's group¹ did not interact with DNA but they interacted with mitochondrial proteins and damaged mitochondria.² We ultimately would like to prepare luminescent gold(III) complexes which could be "tracked" inside the cells by techniques like fluorescent microscopy.

I prepared a luminescent phosphine (**1**) derived from naphthalene and I synthesize a novel iminophosphorane ligand (**2**) derived from **1** (Scheme 1). I also have attempted the lithiation of **2** with

the aim to prepare organomercury derivatives to get to the cyclometalated gold(III) complexes. I have become familiar with synthetic techniques (while working under inter atmosphere and using schlenk line techniques), purification techniques (chromatography and flash chromatography) and characterization techniques (IR Nr and mass spectrometry).

CHEM – 4 ANTIBACTERIAL VS. REGULAR SOAP

Dahlia Hatab (HS) , Farjana Akhtar (HS) and Roba Abdelrahman (HS), New Utrecht High School, Brooklyn, NY, Brooklyn Technical High School, Brooklyn, NY

Millions of bacteria live on bathroom doorknobs at home and at our schools. The problem is whether antibacterial soap kills more bacteria compared to regular, non-antibacterial soap. The hypothesis is that antibacterial soap kills more bacteria than regular soap.

Samples of bacteria were swiped from doorknobs in our homes and at our two schools, and then transferred to nutrient agar Petri dishes. The bacteria were cultured at room temperature for several days until colonies appeared on the agar. An oil-immersion lens of a compound microscope was used to identify the species, and a sample of each was cultured on a separate dish. The dishes were divided into four sections and a soap-soaked paper disk was placed in each section; two of the disks were soaked in antibacterial soap solutions (two different brands) and the other two in the same brands of regular soap solution.

As expected, the disks with the antibacterial soap had, on average, larger diameters of bacteria-free areas around them compared to the regular soap disks. However, after repeating the experiment, it was observed that in cultures from our school doorknobs two of the bacteria species were not only thriving with the regular soap, they appeared to be unaffected by the antibacterial soap too. This means that there are bacteria present on our school bathroom doorknobs that are resistant to the antibacterial soaps. Therefore, antibacterial soap cannot be relied on to kill all the bacteria present on doorknob surfaces in our schools. In conclusion, antibacterial soap is usually, but not always, better at killing bacteria.

CHEM – 5 DEVELOPMENT OF A LISTERIA-POLIOVIRUS VACCINE TO TREAT CANCER AT YOUNG AND OLD AGE

Lukman Solola (UN)¹, Wilber Quispe², and Claudia Gravekamp², ¹Brooklyn College, Brooklyn, NY, ²Microbiology and Immunology, Albert Einstein College of Medicine, Bronx, NY,

Cancer is a disease of the elderly. However, elderly react less efficiently to vaccines than young adults, due to lack of naïve T cells (react for the first time to new antigens). One way to address this problem is to develop a *Listeria monocytogenes* (LM)-based vaccine expressing recall antigens. Most individuals have been exposed to recall antigens such as tetanus toxoid (TT), measles virus, poliovirus (PV) etc, during childhood through vaccination, and developed memory cytotoxic T lymphocytes (CTL) to these antigens. Recently, our lab discovered that the *Listeria* bacteria selectively infect tumor cells (and macrophages). We hypothesize that immunizing elderly cancer patients with *Listeria*-recall antigen will reactivate memory (CTL) against recall antigens (generated during childhood) without the need of naive T cells at old age, and that these memory CTL will kill the infected tumor cells now highly expressing recall antigens. To test this hypothesis, we will develop a *Listeria* vaccine expressing PV antigens (LM-PV). First, a DNA-fragment carrying immunodominant epitopes of the PV has been amplified by polymerase chain reaction (PCR) from pTM7, cloned into pCR2.1, and analyzed by restriction digestion and DNA sequencing. Subsequently, the PV fragment will be subcloned into a listerial plasmid pGG34 (pGG34-PV), and finally transfected into a highly attenuated LM (XFL-7). Once the LM-PV has been generated, we will test the LM-PV vaccine in young and old mice with breast cancer, and expect that PV-specific memory CTL (generated at young age) reactivated by vaccination with LM-PV will reduce tumor growth at both ages.

This work was supported by SURP and a NIA/NCI-funded grant (1 R01 AG023096). We thank Swathi Krishnan for helping Lukman with initial experiments.

CHEM – 6 RUTHENIUM NANOPARTICLES SUPPORTED ON POLY(4-VINYLPYRIDINE) AS CATALYST FOR HYDROGENATION OF AROMATICS AND EVIDENCE FOR A DUAL SITE MECHANISMS

Minfeng Fang (GRAD) and Roberto A. Sanchez-Delgado, Brooklyn College and The Graduate Center, The City University of New York (CUNY), The Environmental Science Analytical Center (ESAC), Brooklyn College, CUNY

Fossil fuels currently provide over 80% of all the energy consumed in the US, according to the DOE. Even with aggressive development of renewable and nuclear technologies, it is likely that the nation's reliance on fossil fuels will increase over at least the next two decades. Current legislation imposes severe limits on the amounts of aromatics, sulfur and nitrogen in fuels, which is difficult to achieve with current refining technologies. Catalytic hydrogenation may play an important role in the production of cleaner fuels as a key step in HDS and HDN processes but conventional catalysts require drastic conditions and/or are easily poisoned. Therefore, there is a need for new efficient catalysts for hydrogenation reactions relevant to the production of cleaner fossil fuels.

A novel nanostructured catalyst Ru/PVPy has been synthesized and characterized by TEM, XRD and XPS, and has proved to be a versatile catalyst for the hydrogenation of mono- and poly-cyclic arenes and N-heteroaromatics, representative of components of petroleum-derived fuels. The effect of solvent polarity and addition of external acid or base, substrate competition experiments and selective thiophene poisoning tests suggest the existence of two distinct active sites in the nanostructure that lead to two parallel hydrogenation pathways, one for simple aromatics involving conventional homolytic hydrogen splitting on Ru and a second one for N-heteroaromatics taking place via a novel heterolytic hydrogen activation on the catalyst surface, assisted by the basic pyridine groups of the support.

Supported by Grants 47472-AC3 and DE-EE0003129.

CHEM - 7 HONEY KILLS, HONEY HILLS! HOW TO DIFFER GOOD HONEY FROM BAD HONEY AND CAN IT TREAT NOT VERY PLEASANT CONDITIONS LIKE ACNE?

Lusine Gasparyan (HS) and Barrington Harvey, James Madison High School, Brooklyn, NY

The problem that was investigated was how honey can be used to treat common human conditions called acne. The hypothesis is that honey is a good acne treatment (for people who are not allergic to honey) and that not all the honeys are good quality most of them have odd ingredients in them. Based upon certain criteria a study was done to determine which of the four brands of honey the best was. The stream, the drop formation, the viscosity, the water content were determined the conclusion showed that not all the brands were of high quality. To simulate the treatment of acne with honey leaves from a commonly available plant was used. Honey was applied to the surface of the leaves and was left for a determined period of time. Some leaves were also treated with a known acne medication. The last stage of the study is being completed.

CHEM – 8 WHAT ARE THE ANXIOLYTIC EFFECTS OF NICOTINE ON POECILIA RETICULATA?

Azka Javaid (HS), James Madison High School

Anxiolytic effects of nicotine have been researched for numerous years on rodents and fish. Understanding the natural anxiolytic effects of nicotine can help produce better procedures and medicines to cure nicotine withdrawal symptoms and can also help prevent addiction caused by nicotine and its anxiolytic effects. To conduct this experiment, *Poecilia Reticulata* or guppy were used. Fish was separated in infant and adult fish. *Poecilia Reticulata* are very timid fish and usually spend major of their time at one specific place. When predation skills are required, they can speed pass by the predator. This quality was taken as an advantage to easily test the anxiolytic effect of nicotine on *Poecilia Reticulata*. Four solutions were prepared using nicotine stock solution and added water. The preparation of solutions was based on the research that one cigarette contains 10 milligrams (mg) of nicotine and 10 mg equalize about 10 milliliters (ml). Therefore, solution was based on 1mg/ml. On this basis, four solutions of 0.04 mg/ml, 0.02 mg/ml, 0.4 mg/ml and 0.2 mg/ml were prepared. Four fish were used for each trial and each fish was exposed to the specific solution mentioned for one minute. After one minute exposure to nicotine, fish's swimming rate was noticed which corresponded to the

anxiolytic effects of nicotine. The results were compared to the original sample of fish in the tank which was stored without any exposure to nicotine and served as the control. It was found that both infant and adult fish exposed to 0.2 mg/ml solution was less active compared to the control and to other solutions of 0.04 mg/ml, 0.02 mg/ml and 0.4 mg/ml. Due to these results, a correlation was established which explored that as the concentration of nicotine amongst the fish increased, the swimming rate of the fish decreased which meant that fish were more relaxed after the exposure to nicotine. This finding was significant because it helped support the real life behavior portrayed by smokers who feel relaxed after consumption of nicotine. This behavior can be related to nicotine and its anxiolytic effects and can help predict that a significant population is attracted and addicted to smoking due to its anxiolytic effects.

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LEGEND:

BIO – Biology

CHEM – Chemistry

CIS – Computer Science

ENV – Environmental

HNS – Health and Nutrition Science

PHYSICS

PSY – Psychology

SCAS – Speech