



Science Research Day

May 1, 2009



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19TH ANNUAL BROOKLYN COLLEGE SCIENCE DAY

PROGRAM

9:30 AM	POSTER SETUP
10:00—12:00	STUDENT PRESENTATIONS AND JUDGING
12:15 PM	LUNCH IN BEDFORD LOUNGE (SUBO)
12:30 PM	WELCOME AND REMARKS

PRESENTATION OF AWARDS

High School Division

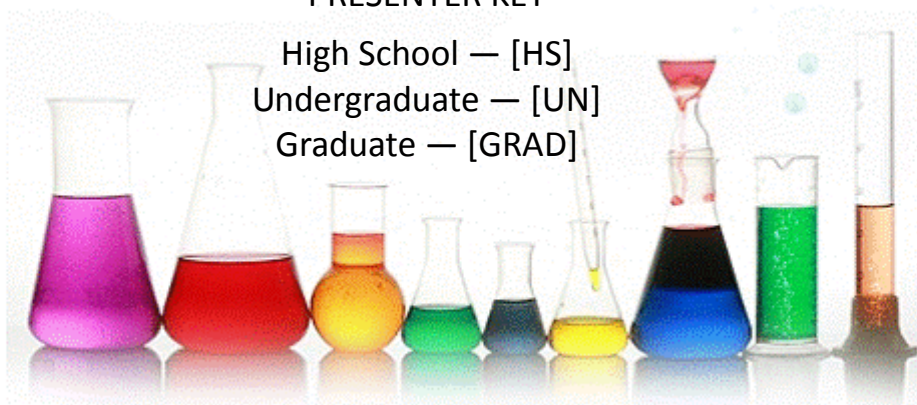
Undergraduate Division

Graduate Division

ALL ARE INVITED TO LUNCH IN THE BEDFORD LOUNGE

PRESENTER KEY

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



PSY- 1 CONDITIONED PREFERENCES FOR GLUCOSE AND FRUCTOSE IN T1R3 KO AND TRPM5 KO MICE**Steven Zukerman**¹(GRAD), Robert F. Margolskee², Anthony Sclafani¹¹Brooklyn College of CUNY, Brooklyn, NY, United States; ²Mount Sinai School of Medicine, New York, NY, United States

Deletion of the genes for the sweet taste receptor subunit T1R3 or the signaling protein Trpm5 greatly attenuates sweetener preference in mice. However, knockout (KO) mice missing T1R3 or Trpm5 develop preferences for sucrose solutions in 24-h tests due to the post-oral actions of the sugar. The present study compared the preferences of KO and C57BL/6J wildtype (WT) mice for glucose and fructose in 24-h taste tests with 0.5-32% sugar vs. water. Unlike glucose and sucrose, fructose has minimal post-oral reward effects. T1R3 KO mice were initially indifferent to dilute glucose solutions (0.5-4%) but developed preferences for 8-32% sugar in test 1. They strongly preferred (~90%) all glucose concentrations in test 2. New T1R3 KO mice were indifferent to 0.5-8% fructose but avoided 16-32% fructose in both tests. Trpm5 KO mice were indifferent to 0.5-4% glucose but preferred 8-32% glucose in test 1 and all concentrations in test 2. New Trpm5 KO mice were indifferent to 0.5-32% fructose in test 1 but mildly preferred (~75%) fructose in test 2. WT mice preferred glucose and fructose in both tests. Why T1R3 KO but not Trpm5 KO mice avoided 16-32% fructose is uncertain. Perhaps fructose absorption is impaired in T1R3 KO mice (due to missing gut T1R3 receptors) which inhibits fructose intake. Yet T1R3 KO and Trpm5 KO mice given glucose in tests 1 and 2 subsequently displayed strong (~90%) preferences for 0.5%-32% fructose in a third test. Apparently, the post-oral effects of glucose condition a strong preference for the sugar's T1R3-independent orosensory properties (odor, texture) that generalize to those of fructose. Fructose, rather than glucose or sucrose, can be used with taste-impaired KO mice to evaluate 24-h sugar taste preferences with post-oral reward effects minimized.

Supported by NIH grants DK031135 (AS), DC03055 and DC03155 (RFM)

PSY – 2 THE EFFECT OF ECONOMIC CRISIS MESSAGE FRAMES ON SELF-REPORTED LEVELS OF HOPE AMONGST WORKING ADULTS AND STUDENTS**Matthew Moore** (UN), **Mohammed Riad** (UN), **Ilan Ron** (UN), & Adam Johnson, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

In the 1980's, the concept of hope began to garner serious empirical attention as a distinct and measurable psychological construct, and given the much-discussed influence of hopeful thinking on economic stability and volatility, its study is ever more pertinent in today's economic climate. In our experiment, we examined the effect of positive versus negative economic message frames on self-reported hope among student and adult populations. Proceeding from the definition for hope proposed by C.R. Snyder (1991), the present study utilized Snyder's eight-item Dispositional Hope Scale (DHS), in combination with a four-item scale assessing optimism about short term prospects, to compare self-reported hope levels in a sample of 46 people (26 college students and 20 non-college working adults). Prior to completing the hope scale, participants randomly received either a positively- or negatively-themed news article that focused on the current global economic crisis. Results of the study indicated that adults (vs. students) exhibited significantly greater hopefulness about short-term prospects, regardless of the manipulation. Further, among adult participants, dispositional hope scores were significantly higher for those who read the *negatively* (vs. positively) framed essay. This result seems to be driven by the responses of male participants, though the interaction with gender does not reach conventional significance levels due to low statistical power. Together, the results indicate that working adults may bolster their sense of hope and agency in the face of economic uncertainty, possibly as a protective or coping measure.

PSY – 3 THE ROLE OF THE DORSAL HIPPOCAMPUS IN RENEWAL AND SPONTANEOUS RECOVERY OF EXTINGUISHED APPETITIVE LEARNING

Vincent Campese (GRAD) & Andrew R. Delamater (Brooklyn College – CUNY), Department of Psychology, Brooklyn, NY

We examined the role of the dorsal hippocampus (DH) in renewal and spontaneous recovery (SR) of extinguished appetitive magazine approach responding in rats. The DH was inactivated by infusing muscimol (a GABA_A receptor agonist) prior to tests for renewal and SR. Subjects in Experiment 1 were trained to associate 2 stimuli with food in 2 different contexts (i.e., Ctx 1: S1+, Ctx 2: S2+). Each stimulus was then extinguished in the other cue's training context (i.e., Ctx 1: S2-, Ctx 2: S1-). Both cues were then tested in each context (i.e., Ctx 1: S1-, S2-; Ctx 2: S1-, S2-) to produce a within-subject assessment of ABA vs. ABB renewal. Subjects receiving DH inactivation as well as control subjects displayed more responding to the cues when they were tested in their training as opposed to extinction context. However, using these same subjects, DH inactivation was shown to attenuate accuracy on a non-matching to place task. These results suggest that the DH is not involved in the expression of contextually gated conditional learning. Experiment 2, however, showed that inactivation of the DH prior to testing for SR, another phenomenon that has been interpreted in terms of conditional learning, disrupted response recovery compared to animals given vehicle infusions.

Research Supported by NIMH Grant MH65947-3 Awarded to A.R. Delamater and Doctoral Research Grant Competitions 2 (2007) and 4 (2009) Awarded to V. Campese

PSY – 4 THE RELATIONSHIP BETWEEN SPENDING AND MOOD: THE MODERATING ROLE OF RELIGION AND GENDER

Uzma Siddique (UN), **Siddra Z. Chaudhry** (UN), & Adam Johnson, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

The goal of this experiment was to see if shopping with or without budgetary constraints would have any effect on mood, and if so, for whom. We hypothesized that differing norms of restraint between high-religious vs. low-religious participants would cause high-religious people to be happier when shopping with a limited budget and low-religious people to be happier after shopping without limits. Further, we tested the stereotypical notion that women, more than men, use shopping as a mood regulator. The sample in this study consisted of 36 participants (17 male and 19 female). Participants were asked to volunteer for a short study in which they would be shopping for personal items online (at www.polyvore.com). Half of the participants were given a \$200 budget during the task, and half were given an unlimited budget. Both participants filled out a brief mood introspection scale, before and after the shopping task, and then also completed an online questionnaire containing demographic questions about religiosity. Results indicate that shopping with an unlimited budget caused an improved mood (less negative and more positive) only among people who reported low religiosity, whereas highly religious participants showed this improved mood pattern only after shopping with a *restricted* budget. Further, men but not women showed an increase in happiness while on an unlimited budget. These findings suggest that not only do consumer decisions affect mood states differently as a function of one's social values, but also that consumer behavior may be an expression of one's social values.

PSY – 5 STEVIA SWEETENER PREFERENCE IN RATS AND MICE

Mahsa Bahrani (GRAD) and Anthony Sciafani, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY

Stevia, a sweetener from the plant *Stevia rebaudiana*, is currently marketed as a “natural” sweetener for soft drinks and juices. This experiment investigated stevia preference in rats and mice, species that are commonly used to study the behavioral and physiological responses to sweeteners. Rodents are attracted to some (e.g., saccharin) but not all (e.g., aspartame) artificial sweeteners. Adult female rats and mice were given 24-h two-bottle tests with water vs. Stevia Max at 0.001 – 1% concentrations.

(Stevia Max is a mixture of the sweet glycosides stevioside and rebaudioside A.) For comparison other rats and mice were tested with saccharin. Mice displayed a preference for stevia solutions that peaked at 0.01% but avoided 1% stevia, whereas they showed strong preferences for 0.01 – 1% saccharin solutions. Preliminary findings indicate that rats prefer 0.01 – 0.03% stevia solutions but avoid 1% stevia. These results indicate that stevia is palatable to mice and rats at some concentrations and suggest that stevia, like saccharin, but unlike aspartame, has a sweet taste to rodents.

PSY – 6 THE ROLE OF LATERAL INHIBITORY CONNECTIONS IN SELF-ORGANIZING NEURAL MODELS

Briana Young (GRAD) and Frank W. Grasso, Biomimetic and Cognitive Robotics Lab, Department of Psychology, Brooklyn College, CUNY Brooklyn, NY 11210

The question of how neural networks are organized in a way that produces optimal behaviors is one central to the field of psychology. One theoretical perspective is that certain networks are self-organizing via Hebbian and anti-Hebbian learning mechanisms; that is, that connections between neurons are strengthened as a result of firing in correlation with certain forms of activity (Hebbian) or weakened as a result of “incorrect” firing in response to patterns that are not correlated (anti-Hebbian). We implemented such a network using vectors and matrix mathematics to represent sensory inputs to a “hidden layer” of neuron-like units. The aim was to produce self-organized, perceptually-grouped outputs that mapped the entire input space efficiently. The input weights to the hidden layer were a matrix of adaptable (Hebbian) weights. In addition a fixed array of lateral inhibitory connections between the hidden units served to sharpen the partitioning of the input space available to the network. We implemented this algorithm on a C++ programming platform suitable for integration into a robot. This network architecture produced a mapping that is not a strict mapping of one input to a given output. Rather, this architecture is dynamic in that the output depends on the input and the recent history of inputs. Simulations produced indicated the ability of this system to self-adjust the connections between inputs and hidden units to a stable asymptote over repeated presentations of a set of training vectors. The strength of the lateral inhibitory connections determines whether or not a stable solution exists, and controls the resolution of the sensory space partitioning of such a result.

PSY – 7 SCANNING OF ACOUSTIC SPACE USING A MODEL OF A BAT’S EAR

Alex Afanasyev² (HS), Gregory E. Perrin¹ and Frank W. Grasso¹

¹ Department of Psychology, Brooklyn College, The City University of New York, Brooklyn, NY 11210;

² Department of Intel Science, Midwood High School at Brooklyn College, Brooklyn 11210

We undertook this project to further our understanding of the bat’s echolocation ability. It is well understood that many bats scan their surroundings using acoustic signals, an ability called echolocation. The ultimate goal of this work is to produce a new type of acoustic sensor, modeled off the outer ear of echolocating bats. Here, we used an audio speaker as a sound source to mimic the bat’s echolocation calls and tested the spatial and frequency sensitivity of a model ear. In prior research, we found that the outer ear may allow a bat to scan its surroundings without active movement. Here, we demonstrate that, like those we previously studied, this new and more open ear shape shows sensitivity to sounds of different frequencies at different angles. This provides further evidence that the shape of an ear can produce an acoustic scanning of space without movement, an effect we and others have called Frequency Swept Fanbeams (FSFs).

PSY – 8 DETERMINING IF MONK PARAKEETS PERFORM COOPERATIVE BREEDING: A FOCAL NEST CASE STUDY

Joshua I. Benezra (UN), Corentin Bohl, and Frank W. Grasso, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

Individuals involved in raising offspring that they did not produce is called cooperative breeding. Monk parakeets are very social animals that act and nest together gregariously, and it has been suggested based on field studies that Monk parakeets participate in cooperative breeding. This study seeks

evidence of cooperative breeding amongst Monk parakeets in the nativized Brooklyn population. To determine this we video taped one large, accessible nest that has seven separate entrances leading to enclosed chambers where birds can lay eggs, raise offspring and shelter. Over the course of three weeks we recorded the number of Monk parakeets entering each of five chambers at sunset to shelter for the night. We plan to continue these observations for the remainder of the mating session (through early May). Two of the observed chambers are apparently unused and three show use by at least a pair of parakeets each. At present these results do not support the hypothesis of cooperative breeding at this nest. We will report on the complete set of observations once they have been obtained.

PSY – 9 INTER-SUCKER COORDINATION DURING DIFFERENT ARM MOVEMENTS IN THE PACIFIC GIANT OCTOPUS *ENTEROCTOPUS DOFLEINI*

Stavros P. Hadjisolomou (UN) and Frank W. Grasso, BioMimetic and Cognitive Robotics Laboratory, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

Cephalopod appendages can produce movements with a virtually infinite number of degrees of freedom. The mechanisms for fine control of grasping and manipulation movements are just beginning to be understood. We believe that the suckers of the octopus arm, acting as part of this hyper redundant system, are not passive agents but actively contribute to grasping and manipulation. We hypothesized that inter-sucker coordination would be higher with goal-directed arm movements rather than passive movements. To pursue evidence for this hypothesis we tracked the movements of suckers from digitized video footage single arms on two Giant Pacific Octopuses engaged in movements visible through sheets of glass. We computed the cross-correlation of independent sucker movements during 3 different types of arm motion: “arm walk”, “arm reach” and “passive carry”. Overall, the correlation of movement was stronger between neighboring suckers in active arm movements. We also observed patterns of coordination that varied with sucker neighborhood and time. We tentatively conclude, pending replication, that suckers movements are not passively generated and there is a coordinated, independent use of them in order to assist specific goal-directed arm movements.

The research reported here was supported in part by DARPA DSO BioDynamics Program (Subcontract 882-7558-203-2004599 through Clemson University (Ian Walker PI) Program Officer: Morley Stone.

PSY – 10 ANATOMICAL INVESTIGATION OF THE INK SYSTEM IN *OCTOPUS BIMACULOIDES*

Mei Ho¹ (UN) and Frank W. Grasso^{2,1},¹Department of Chemistry, Brooklyn College-CUNY, Brooklyn, NY 11210, ²BioMimetic and Cognitive Robotics Lab, Department of Psychology, Brooklyn College, CUNY Brooklyn, NY 11210

Coleoid cephalopods (cuttlefishes, squids and octopuses) are thought eject ink as a behavioral response to threat and possibly to signal conspecifics. Squids have been observed to disperse their ink in six different forms: pseudomorphs, pseudomorph-series, ink ropes, smoke screens, mantle fills, and diffuse puffs. Some forms allow the squid to hide while others serve as a decoy letting the animal quickly jet away. Each kind of ink release produces ink of varying properties. The variety of ink releases might result from the mechanics of the animal's release behavior or chemical alteration of the composition of the ink at the time of release or both. Of particular interest is how the animal controls its ink *in situ* to produce desirable characteristics once released. We hypothesized that the chemical composition of the ink in the octopus's ink gland might differ chemically from the ink that is released to produce different morphs. We previously have developed techniques to collect released ink from cephalopods under controlled conditions for chemical analysis. We report here on our anatomical investigations into methods to extract ink from inside living octopuses for repeated collection at separate intervals. (All published ink collection for chemical analysis has been done post-mortem.) We discovered it is difficult to extract ink without damaging the overlaying anterior vena cava. By measuring the composition of the various components of ink, we hope to ultimately trace the changes made in the ink to give it the distinct and unique properties found in the six release forms.

PSY – 11 NEST USE PATTERNS MONK PARAKEETS IN NEW YORK

Ednerlande Jean¹(HS), Corentin Bohl^{2,3}, Josh Benezra⁴, Chris Petersen² and Frank W. Grasso^{2,3},
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The Monk Parakeets (*Myiopsitta monachus*) are originally from South America and may cooperate to raise their young. They are now residing in New York and this makes us wonder whether or not they are communal breeders in their new home. The goal of the research is to find evidence for communal breeding from observations of fledglings and adults associated with nests on the Brooklyn College athletic field. The research uses the parakeets in. We observed monk parakeets' nests located on the light posts at least 2 days every week and record the number of birds' arrivals and departures from chambers. This research may give an idea of the how the Monk parakeets develop based on their adaption in the city.

PSY – 12 MEMORY IN CHEMICAL TRACKING, A PARAMETER OPTIMIZATION STUDY

Kamil Kloskowski (GRAD), Zohar Pasternak, Frank W. Grasso, BioMimetic and Cognitive
Robotics Laboratory, Department of Psychology, Brooklyn College 11210

The problem of chemical tracking is an important one. Knowing how to locate sources of chemicals is something that many animals use to search for food or mates. Humans, aided by technology, can use it to locate sources of pollution or explosives. We used computer simulations in a turbulent-flow simulator to conduct a parameter search study, to explore a motion strategy that separates movement into step length and direction that are governed by stochastic algorithms, Levy-walk and correlated random walk (CRW) respectively. Both have parameters that vary the degree of randomness associated with the output. We chose to keep the one associated with levy-walk (μ) constant and vary the CRW (ρ) parameter. The change in agent direction is governed by ρ and the flow direction and chemical concentration input. The chemical concentration signal is processed to construct, through system memory, intermittency (I) and chemical concentration (C) estimates. Agent steering is biased by a proportion of the best I and C encountered compared to the present I and C. Those ratios are then combined using the four experimental parameters to produce a p value. We ran over 11,000 simulation with a variety of parameter settings. We evaluated performance in terms of absolute success (hits) and efficiency. We found that parameter combinations with high variance in permissible I and C (high tolerance) produced better tracking results than more rigid (small) ones. This suggests a role for memory in effective chemical tracking in environments characterized by turbulent flow.

PSY – 13 GUANOSINE MONOPHOSPHATE AND IT'S EFFECT ON AXOLOTL'S WEIGHT

Adis Malevic¹(HS) and Frank W. Grasso², ¹Midwood High School at Brooklyn College,
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Guanosine Monophosphate (GMP) is a nucleotide found in RNA and a second messenger important in the regulation of the development of vertebrates. We hypothesized that GMP would effect the development of axolotls. The purpose of this study is to see if GMP affects the weight of Axolotls. We divided 40 larval axolotls into 4 groups: a control with no GMP and three doses of GMP, a low dose, medium dose, and a high dose. Axolotls living for 33 days in a high dose of GMP showed significantly lower body weights than animals in the other groups. According to this evidence we conclude that the higher the doss of GMP the smaller the animal. GMP affects the growth of axolotls inversely.

This project was funded in part by an award to the American Psychological Foundation Project "Advancing the Science and Practice of Psychology through the Mentoring of Diverse High School Students in the Borough of Brooklyn." (Prof. Laura Rabin, Psychology, Brooklyn College, PI)

PSY – 14 SPATIAL SENSITIVITY OF ECHOLOCATING BATS

Gregory E. Perrin¹ (UN), Rolf Müller^{2,3}, Frank W. Grasso^{1,1} Department of Psychology, Brooklyn College, The City University of New York, Brooklyn, New York², School of Physics, Shandong University, Jinan, China, ³Virginia Polytechnic Institute and State University, Blacksburg, Virginia

Many species of animals use acoustic signals to provide them with spatial information. For many species information is organized and perceived with relation to the delay between a signal reaching two ears by computing the inter-aural delay. This allows for a relatively accurate scan of horizontal space in plane with the two ears. Both others' and our own previous work suggests that echolocating bats employ a second mechanism extracting information about the location of objects in vertical space with their ears. Our work specifically shows that the outer ear structures, the *pinna* and the *tragus* both play a role in manipulating the spatial sensitivity of a model bat ear. We have furthered this study by testing models of two other ear flaps (*anti-tragus*), and the ridges located on the inner surface of the *pinna*. We have shown that the *pinna* on its own creates a scanning effect in the frequency domain; a phenomenon referred to as 'Frequency Swept Fanbeams' (FSFs). Additionally, the *tragus* may further augment, and ultimately enhance, the ear's scanning function in a plane perpendicular to the ear. Here we extend our results to a second, more biologically detailed model of the bat ear *pinna*, including a *tragus*, additional flaps called *anti-tragus*, and pinna ridges. Once again FSFs persists and offer an empirical way of exploring the interactive effects of these various structures.

PSY – 15 SEASONAL STICK FORAGING TENDANCIES OF MONK PARAKEETS (*MYIOPSITTA MONACHUS*) ON BROOKLYN COLLEGE CAMPUS

Christopher L. Petersen (UN) and Frank W. Grasso, BioMimetic and Cognitive Robotics Lab, Department of Psychology, Brooklyn College, CUNY Brooklyn, NY 11210

Monk parakeets are exceptional amongst birds in that they live in large social groups and build elaborate multi-chambered nests for year-round habitation. We hypothesized that, despite year-round nest maintenance, nest construction would increase as the breeding season approaches. We counted the number of sticks being carried to the nest by parrots at different times of the day for two months leading up to the 2009 breeding season. Out of the nests surveyed, there was a small effect on the time of the year on the amount of sticks carried ($r(237) = 0.11$, $p < .05$; $r^2 = 0.01$). We found that 2 out of 4 nests surveyed approached statistical significance (Nest 3: $r(78) = 0.19$, $p < 0.09$, Nest 4: $r(78) = 0.19$, $p < 0.09$). The remaining 2 nests did not approach statistical significance (Nest 5: $r(78) = 0.16$ N.S., Nest 6: $r(77) = 0.05$ N.S.). We tentatively conclude that monk parakeet nest construction behavior increases in preparation for their breeding season.

PSY – 16 USING PHOTOTAXIS AND OBSTACLE AVOIDANCE IN A SIMULATED KHEPERA ROBOT TO FIND A LIGHT SOURCE

Lawrence Tse¹ (HS), Kamil Koslowski² and Frank W. Grasso^{2, 1} Midwood High School @ Brooklyn College, Brooklyn, NY 11210, ²Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

We aim to resolve conflicts between alternative behaviors within autonomous robots. This is a general problem that is of wide interest. An example is when a person is lost in a dark cavern; a robot could aid the person out of the cave by finding light a person couldn't detect, while avoiding obstacles. The two behaviors, tracking light and avoiding obstacles can sometimes lead to conflicting behavior. Our hypothesis is that it is possible for a robot to be able to resolve conflicts between phototactic behavior and obstacle avoidance behavior. We tested a behavioral strategy combining phototaxis and obstacle avoidance to evaluate our hypothesis. We simulated a khepera (robot) using Webots™. We started the khepera at 5 different positions in multiple trials. In half the trials we introduced a small obstacle. The khepera succeeded in getting to the light source in every trial; therefore we had a 100% rate of success. However there was a 2 second difference between the average time to arrive at the light source without an obstacle and with the small obstacle present. Our conclusion is that a real-world robot would be able to find a path to the light source.

PSY – 17 A COMPUTATIONAL MODEL OF SPATIAL LEARNING IN THE DECAPOD CRUSTACEAN *CHERAX DESTRUCTOR*

Stephen G. Volz (GRAD) and Frank W. Grasso, BioMimetic and Cognitive Robotics Lab, Department of Psychology, Brooklyn College, CUNY Brooklyn, NY 11210

Although the use of tactile sensory information to form spatial representations has been described in many species across several taxa, little is known about their computational mechanisms or the strategies neural systems use to manipulate them. The freshwater crayfish, *Cherax destructor* has been shown to discriminate between distinct spatial configurations of behavioral arenas by relying only on haptic sensory information. We propose a computational model that attempts to account for this ability that generates a one-dimensional representation of the two-dimensional perimeter of the arena. The model employs a correlation algorithm to detect patterns within this linear representation. We tested this model using a simulated Khepra robot platform, which was programmed to explore its environment maintaining constant mechanical contacts with the walls, and log each wall length by monitoring the distance it had traveled. By comparing the pattern of distances experienced with those encountered before the robot was able to either learn the shape of a particular arena or to recognize it as a previously encountered arena. This robotic model produces results similar to those observed in the real crayfish, in terms of exploration required to learn a novel environment, and exploration required to recognize a previously learned environment, despite the simple nature of the algorithm. This provides evidence supporting the position that crayfish may be employing a similarly constituted correlational mechanism to discriminate between tactically perceived environments, and opens up several avenues for further study of this cognitive system using parallel biological and computational studies.

PSY – 18 SUGAR-CONDITIONED PREFERENCES IN NORMAL AND SWEET “TASTELESS” MICE

Kevin Lemaire (UN) and Anthony Sclafani, Department of Psychology, Brooklyn College of CUNY

The sweet taste of sugars is thought to be the primary determinant of intake and preference. However, sugars also have post-oral effects in the gut. This study used sweet “tasteless” and normal mice to study the oral and post-oral actions of three different sugars. Trpm5 knockout mice (KO), with non-functioning sweet taste cells, and normal mice (B6) were trained 24 hr/day with flavored (CS+) sugar solutions and flavored (CS-) water; 8% glucose, fructose and galactose were used. The mice were then given two-bottle tests with the CS+ vs. CS- flavors in water only, followed by sugar vs. water tests with no added flavors. The B6 mice preferred all CS+ flavors to CS- flavors and all three sugars to plain water. The B6 mice consumed more glucose than fructose and galactose. The KO mice preferred both glucose- and galactose-paired CS+ flavors to CS- flavors, as well as both sugars to plain water. They did not, however, prefer the fructose-paired CS+ flavor and only weakly preferred plain fructose. The KO mice consumed more glucose than galactose, and more galactose than fructose. The KO data indicate that the relative potency of the sugars’ post-oral effects is glucose > galactose > fructose. Yet, B6 data from this and other studies indicate that the relative sweetness of the sugars is fructose > glucose > galactose. Ultimately, both taste and post-oral effects determine sugar preference.

Supported by NIH Grant DK031125 and Marc Program.

PSY - 19 SENSORY-SPECIFIC FLAVOR-NUTRIENT ASSOCIATIONS ARE UNAFFECTED BY BASOLATERAL AMYGDALA AND ORBITOFRONTAL CORTEX LESIONS

Janina Scarlet^{1,2} (GRAD), Matthew Fein¹, Vincent Campese^{1,2}, and Andrew Delamater¹,¹Brooklyn College-CUNY, Brooklyn, NY 11210, ²Graduate Center-CUNY, New York, NY 10016

Rats initially received BLA, OFC, or sham lesions and then were trained to associate one flavor with sucrose and another with Polycose, presented in either simultaneous or sequential compounds. One of the nutrients was then devalued. In a choice between the two flavors, lesioned and control rats alike

avoided the flavor associated with the devalued nutrient. These results suggest that sensory-specific flavor-nutrient associations do not depend upon these brain structures.

Grant/Other Support: NIMH Grant 65947

PSY - 20 AN ANALYSIS OF RENEWAL OF EXTINGUISHED SENSORY SPECIFIC ASSOCIATIONS IN PAVLOVIAN CONDITIONING

Lyl Tomlinson (UN) & Andrew Delamater, Department of Psychology, Brooklyn College, NY

Investigations of Pavlovian conditioning in prior work have shown that extinction of conditioned responses is context specific. A more precise measurement of learning involves investigating the pairing of a stimulus with a reward's sensory properties (sensory specific associations). The current study, based on the work of Delamater (1996) attempted to determine the effects of non-acquisition contexts during extinction on sensory specific associations. Thirty two Long-Evans rats were used. Subjects were placed in operant chambers and given instrumental training with two different instrumental responses paired with different outcomes (sucrose and pellets). The rats were then trained to two different cues (flashing lights and noise). Afterwards, some subjects were presented with cues but not rewarded (extinguishing the cues) in the acquisition context and some in the new context (Group AAA & ABA). The other rats were split up and some were placed in the acquisition context and others were placed in the new context without being extinguished to the cues (Group Context 1 & Context 2). Finally, all subjects were placed in the original acquisition context and given the opportunity to instrumentally respond to both cues during a session (Pavlovian-Instrumental transfer tests). Group AAA showed no control of the sensory specific association, whereas group ABA showed a recovery of control of sensory specific associations (renewal). The results obtained from these groups are suggestive of a masking of the sensory specific association during extinction, but further testing is required to make the claim based on statistically significant data.

PSY – 21 DIFFERENTIAL OUTCOMES OF IMMIGRATION-RELATED DISAGREEMENT FOR NATIVE CITIZENS AND NON-NATIVE IMMIGRANTS: A SYSTEM JUSTIFICATION PERSPECTIVE.

Adam M. Johnson (GRAD), Nikita Malakhov, Ilay Ron, and Curtis D. Hardin, PhD., Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

System Justification Theory suggest that low-status groups are psychologically motivated to defend the status quo, even at the expense of group interests, while the attitudes high-status groups may be psychologically "freer" to vary. However, the effect of interpersonal sources of system-threat vs. system-bolstering on this pattern had not been tested and was done so in two experiments using citizen and non-native participants. In Experiment 1, participants wrote a short essay about immigration issues in the US. Half were instructed to write about the national debate, and half were instructed to write about a debate between two close others. All participants were then forced to defend *pro*-immigration opinions, *anti*-immigration opinions, or the merits of *both* opinions. Finally, participants filled out likert-type items assessing immigration attitudes. For those in the "close others" condition, native citizens forced to defend the anti (vs. pro) immigration opinion later express more positive immigration attitudes, while non-native immigrants forced to defend the anti (vs. pro) immigration opinion later express more negative immigration attitudes. In Experiment 2, participants anticipated interacting with someone who either agreed or disagreed with a close other's pro-immigration point of view. Native citizens who anticipated disagreement expressed greater support for equality-enhancing ideologies (as measured by Social Dominance and System Justification scales), but non-native immigrants expressed greater support for status-quo bolstering ideologies. Together, these findings suggest that pro-immigration consensus allows citizens to show decreased intergroup prejudice and increased endorsement of equality, while anti-immigration consensus leads immigrants to express in-group derogation and system-bolstering.

PSY – 22 MUSIC AND THE WAY IT AFFECTS MEMORY

Dalila Bicic (HS), Frances Fisher, Franklin Delano Roosevelt High School, Brooklyn, NY

The goal of this study was to prove if music had an affect on memory. It was attempted to listen to music while taking a test and see whether it will affect you brain. Some people took test while listening to music and others didn't. They were graded on the score they had received for the test. The conclusion that came from this is that music helps better which complemented the hypothesis, to show that it was correct.

Other studies that have been done also came out with the same result. The way it helps function the brain will change depending on the tempo and beat. The faster the beat and tempo are the better it helped. The slower the tempo and beat were the less it had helped. This is important because it can influence people throughout their everyday life.

PSY – 23 DIFFERENCE IN MEMORY BETWEEN MALE AND FEMALE

Luthfunnahar Dewan (HS), Frances Fisher, Franklin Delano Roosevelt High School, Brooklyn, NY

It is said that women between the ages of 20-40 will remember better because they have more responsibilities to attend to and because they produce estrogen which promotes cell growth in the temporal lobe and therefore helps the women remember better. Research shows that females develop faster than males in so many areas such as learning to talk earlier; learning other languages faster; recognizing faces; remembering names; reacting faster and more severely to pain, and yet can withstand pain over a longer period of time. It is mainly due to the fact that they go through child birth. Who remembers better male or female? It was hypothesized that the female gender remembers better than the male gender because they have more responsibilities.

The purpose of this experiment was to see which gender remembers better, the male or the female. The way this experiment took place was by gathering a group of 10 males and 10 females from the same age group which was 20. Each of them was given a list of 30 words to study with in a minute. After they were done, they were asked to report back the words that they remembered. After the information was gathered, it was averaged up by the number of words that they remembered. This was done with 2 other age groups, male and female in their 30's and 40's.

PSY – 24 WHO HAS THE BEST MEMORY: FEMALE OR MALE

Rifat Ahmed (HS), Frances Fisher, Franklin Delano Roosevelt High School, Brooklyn, NY

As we all know, the brain is a very important part of the human anatomy. Just like a computer, the brain consists of many different components which we use every second of our life. One of the most important parts of the brain is the cerebrum which possesses the memory part of a human. This experiment questions memory and takes it to the next level by subjecting the difference of memory between female or male. This problem arrived when memory is questioned itself. As much as the world has differentiated between the sexes, is memory another reason for the diversity between these two? A method used in this experiment is to combine the genders and set them up in one room. Place a list of daily words used in front of them for a limited amount of time. Then, allow them to recall all of the words from the list. Record the analyzed data of each individual. The average score of each gender is the final result. Results obtained from this experiment is favored more towards the male prospective as to women.

PSY – 25 HOW DOES THE TYPE OF MUSIC AFFECT A PERSON'S READING RATE?

Khushboo Jamal (HS), Frances Fisher, Franklin Delano Roosevelt High School, Brooklyn

The goal of this study is to find out the affect of the different genres of music on a person's reading rate. The average reading rate found by research is about 200-250 words a minute. The two genres of music used in this experiment are rock and classical. The hypothesis is that the classical music will

have no effect on the reading rate, while the rock music may grab the reader's attention away from the text and towards the fast, catchy music and the lyrics of the song. The materials needed for this experiment are two females, two males, a timer, one page excerpt from a book, and lastly; a music playing device.

To find the average reading rate of a person, the reading rate formula is needed which is, $[(\text{number of words in the passage}) / (\text{seconds it took to read the passage})](60) = \text{wpm}$ a person can read. First, the average reading rates of the all subjects without any music is to be found. Next, the average reading rate is to be found with classical music in the background and then rock music. As results show, rock music was proven as a massive distraction and classical music however, sped up the reading rates. Many people tend to listen to music while doing tasks such as homework, which requires reading. So the main purpose of this experiment is how in any way, the music playing affects the person and their reading rate.

PSY – 26 STROOP EFFECT

Anastasiya Lyubimova (HS), Frances Fisher, Franklin Delano Roosevelt High School, Brooklyn, NY

The purpose of this experiment was to see if the Stroop Effect affects our ability to read words more quickly and automatically than we can name colors. This experiment was done by many other scientists before. The stroop effect itself got its name from John Ridley Stroop. The hypothesis was that: The stroop effect will slow down a person's reading rate. Some of the required materials were; a timer, two sheets with colors and color names, and a group of participants. These two papers contained 20 sequences of 5 color words each. One had color words with matching ink and the other sheet had color words with not matching ink. The participants were asked to read both of these papers as fast as they could while they were timed, and their results were recorded. As the result, it took the participants more time to read the paper with non matching color words and that proves the hypothesis to be correct. The Stroop Effect affected people's ability to read. As proven, this effect is used to clinically help people. It is commonly used to investigate physiological disorder in people.

BIO – 1 FERM BINDS ACTIN AND DIRECTS LOCALIZATION OF MYO1P, A CLASS XIV MYOSIN IN *TETRAHYMENA THERMOPHILA*

Michael Gotesman (GRAD), Department of Biology, Graduate Center-CUNY, Brooklyn, NY 11210, Roland E. Hosein, R.H. Gavin, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY

Myo1 is the first of 13 myosins identified in *Tetrahymena thermophila*. The tail of this myosin contains both MyTH4 and FERM domains, which are thought to be respective sites for interaction with the microtubule and actin cytoskeleton. Previous studies have shown that antibodies against a Myo1 motor domain peptide localized to phagosomes and the nucleus and that Myo1 and actin are involved in phagosome motility. We reasoned that an actin-binding region within the FERM domain would facilitate the localization of Myo1 to its targets. A recombinant GFP-MYO1 sequence was created by adding a GFP sequence to the 5' end of the last 1359 nucleotides (including the 924-nucleotide FERM motif) of the Myo1 tail domain. The recombinant sequence was cloned into an rDNA expression vector containing a metallothionein promoter, and the vector was used to transform *Tetrahymena* by biolistic bombardment. Immunoblots of total cell lysate from GFP-expressing cells were probed with anti-GFP antibody and confirmed expression and stability of the 80 kDa GFP-Myo1 fusion protein. Anti-actin antibody pulled down actin and its binding partners from total lysates of GFP-expressing cells. Immunoblots of pull-down fractions detected GFP-Myo1 fusion, actin, and endogenous Myo1 when probed respectively with anti-GFP, anti-actin, and anti-Myo1 antibodies. Confocal microscopy revealed localization of the GFP-Myo1 to phagosomes, nucleus, oral apparatus, and the actin-rich rows of basal bodies in the cortical cytoskeleton. We conclude that localization of Myo1 is achieved through its tail domain and that the tail domain contains an actin-binding region. [Supported by National Science Foundation]

BIO – 2 ALGAE TO BIOFUELS

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Microalgae are photosynthetic organisms that have the capability to synthesize lipids in the form of triacylglycerides and isoprenoids that can be processed for production of jetfuel. The goal of this study was to isolate and identify novel strains of microalgae that have the ability to produce lipids. Samples were collected from habitats such as creeks, rivers, ponds, lakes, and estuaries to obtain algae from a wide variety of environments such as freshwater, brackish, and saline waters. After the samples were obtained, the objective was to isolate different strains of algae using traditional cell culture techniques. In order to identify newly isolated cultures, morphological and molecular biology studies were performed in the lab. In future we hope to find novel strains of algae that yield a high production of lipids.

In a complementary project, genes for enzymes involved in the biosynthesis pathway to isoprenoids were investigated in a phylogenomic study. For synthesis of isoprenoids green algae only possess the MEP (2-C-methyl-D-erythritol 4-phosphate) pathway in which a total of seven enzymes are involved for the production of isopentenyl pyrophosphate (IPP) and dimethylallyl pyrophosphate (DMAPP), which are the precursor molecules for longer chain isoprenes. Enzymes were studied in the genomes of thirteen algae using the database from the Joint Genome Institute, Walnut Creek, CA. BLAST searches were performed to identify potential genes involved in the MEP pathway. The next step in the process was to annotate the genes identified. Future work will include alignments of the sequences obtained and to perform phylogenetic studies.

BIO – 3 DOES ECHINACEA STIMULATE THE GROWTH OF SELECTED BACTERIA IN VITRO?

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Echinacea is a top-selling herb thought to boost the immune system. However, a recent study (Science Times 1/9/07) on 15 volunteers found that the ingestion of 1,000 mg. of Echinacea daily for 10 days stimulated the growth of intestinal bacteria associated with diarrhea, inflammatory bowel disease, and an increased risk of colon cancer. This project was designed to determine if Echinacea will stimulate the growth of *Serratia Marcescens*, *Micrococcus luteus*, and *E. coli* in vitro. Echinacea was

added to 125 ml of sterile agar (control) which was poured into Petri dishes. *Serratia Marcescens* and *Micrococcus luteus* were incubated at room temperature for 48 hours. *E. coli* was incubated at 37 degrees Celsius. The bacterial growth was compared to a control group which was identical to the experimental group but without the Echinacea agar. The *Micrococcus luteus* and *Serratia Marcescens* did not show significant difference from the Echinacea and sterile agar. However, the *E. coli*, which is normally found in the colon showed a greater increase with Echinacea added than in the sterile agar. These findings show a risk for bowel disorders among people taking Echinacea as dietary supplements.

BIO – 4 The Effect of Streptococcal Cytolysin Streptolysin-O (SLO) on Human and Rodent Tumor Cells

Diana Cheung (H.S.) & Ms. Janice Baranowski, Brooklyn Technical High School, Brooklyn, NY

Streptolysin-O (SLO), a cytotoxin released by group A streptococci. SLO induces cell death by aggregating in the plasma membrane of the target cell into a pore-forming oligomeric structure allowing the flow of fluid, as well as large ions and proteins from the cell, leading to rapid lysis of the afflicted cell. In this study, the effect of SLO on tumor cells was examined through treatment with different concentrations of SLO to human melanoma cells in vitro and the measurement of the release of an enzyme, Lactate Dehydrogenase (LDH) into the culture medium of an enzyme. A lethal dose (LD) of SLO was established at which at least 50% (LD50) of the cells were found to release their LDH. When the recorded LD50 for SLO was compared to those of human pancreatic cancer cells cultured in presence of the cytotoxin, it was found that the fibroblasts were much less affected by SLO. Insertion of SLO into the plasma membrane of chemotherapy resistant human melanoma cells was confirmed by immuno-electronmicroscopy.

BIO – 5 PHYLOGENY OF THE TOXIC CARIBBEAN PLANT GENUS COMOCLADIA (ANACARDIACEAE)

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Comocladia contains sixteen or more species of shrubs and trees found within the Caribbean, Central America and Mexico. The lack of data associated with the genus, its distribution, and its toxic nature inspired us to test whether Comocladia is monophyletic. Nine species of Comocladia and eight representatives of other closely related genera in the cashew family (Anacardiaceae) were investigated in order to create a more accurate evolutionary tree of Comocladia. The following two hypotheses were tested: 1) Comocladia is monophyletic; and 2) the evolution of Comocladia is reflective of its distribution in the Caribbean. DNA from two genomes was sequenced for this project: cpDNA trnL and rps16, and nrDNA External Transcribed Spacer (ETS) and Internal Transcribed Spacer (ITS). Parsimony analysis was conducted to reconstruct the evolutionary tree of Comocladia and closely related genera. The resulting tree supported the monophyly of Comocladia and the sister relationship between Comocladia and Metopium that was found previously by Pell. Because of the lack of data, the Caribbean hypothesis cannot be supported. An expanded database is currently being built to test the biogeographic hypothesis. This database may be useful to biogeographers and island biologists who are interested in the Caribbean.

Supported by Brooklyn Botanic Garden Molecular Systematics Laboratory

BIO - 6 AMYLOID-FORMING PEPTIDES FROM FUNGAL ADHESINS

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Candida albicans adhesins bind to peptides and lead to cell aggregation with amyloid properties. We therefore searched in other fungal adhesins for β -aggregation forming sequences with the TANGO algorithm and synthesized three peptides. The *C. albicans* Als5 peptide, SNG (SNGIVAVATRTV), has a 90% β -aggregation potential and forms amyloids (Otoo, et al, Euk. Cell, 7(5): 776-782, 2008). The two additional peptides, from *C. albicans* Eap1 adhesin (HTAVTTGVTITVTND) and *Saccharomyces*

cerevisiae Flo1 adhesin (TDETVIVIRTP), have aggregation potentials of 90% and 42% respectively, and were studied for amyloid formation. Soluble Als5 and Flo11 were also tested.

Peptide interactions were analyzed by circular dichroism (CD), absorbance and fluorescence spectroscopy to monitor secondary structure and amyloid formation. CD spectra showed unstructured random coil for both Eap1 and Flo1 peptides in buffer, changing to β -aggregate, after stirring to induce amyloid formation, with an ellipticity minimum at 230-235nm. The stirred solutions of both Flo1 and Eap1 peptides, Als5 and Flo11 proteins showed an increase in Congo Red absorbance with a shoulder near 540nm and also had an enhanced thioflavin-T fluorescence. Thioflavin-T emission intensity is much greater when it is bound to amyloids and the emission spectra of both amyloid peptides reflected this fluorescence intensity increase. These results with Eap1, Flo1, Als5 and Flo11 suggest a change from non-amyloid characteristics when initially dissolved in buffer to amyloid formation after stirring and time. Therefore, sequences from multiple adhesins show conformational changes leading to amyloid formation.

BIO – 7 ALGAE TO BIOFUEL: ISOLATION OF UNI:ALGAE

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In considering the global need for alternative energy sources, algae as an agro-fuel has become a forerunner for oil production. Algae are feedstock sources for production of renewable energy that not only use carbon emissions as a food source but also are cheap and efficient alternatives to crop based fuel sources such as corn. Algae benefits as a bio-fuel, specifically in its use as a jet-fuel, are its fast growth, adaptability to almost all environments, and diversity. Most importantly, algae are over a hundred times more productive than corn, the standard, in producing biomass for oil generation. In considering the vast diversity found in the algae species, single algae types were isolated from a given water sample based on their physical morphology. Fresh water samples obtained from canals pipe water and ditches from Arizonia, California, Texas and New Mexico, were cultivated on nutrient enriched media plates- TAP (Tris- acetate-phosphate) , HS, BBM (Bold's Basal Medium) and CM (Closterium medium) plates. Screenings, based on the algae's ability to grow optimally on the various media types was used to isolate single colonies and then streaked on media plates. Using light microscopy, identification of algae was made based on algae's physical morphology. Ten uni-algae have been found and later will be screened for oil contents. Further study will be done on identifying enzymes responsible for lipid bio-synthesis and optimum media conditions for high oil yielding algae.

BIO – 8 GFP-GPI MANNOPROTEIN TURNOVER IN *SACCHAROMYCES CEREVISIAE*

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Protein turnover is an essential process that cells undergo in order to maintain a dynamic state of survival. This study investigated the rates of degradation of cell wall mannoproteins of the yeast *Saccharomyces cerevisiae*. Mannoproteins are highly glycosylated polypeptides essential to the function and the protection of the yeast cell; they localize to the cell wall by addition of a glycosyl phosphatidylinositol (GPI) anchor which, if mutated, is lethal to the cell. The yeast strain YM4282 was transformed with a construct expressing mannoprotein under a *GAL1* promoter (induced by growth in galactose and repressed by growth in glucose), and including a region coding for green fluorescent protein (GFP) linked to the GPI anchor. Some cultures were assayed with protease inhibitors pepstatin A and phenylmethylsulphonyl-fluoride to determine which major class of proteinases (aspartyl or seryl, respectively) contributes more to protein degradation. Data from fluorescence microscopy and fluorometry showed that from the start of glucose repression to 9 hours, mannoproteins remained linked to the cell wall, but by 21 hours, they had been excised from the cell wall under all conditions set. The experiment was repeated with a transformed yeast strain YM4283 with similar results. Mannoproteins play a key role in the adhesion of yeast as infectious agents; applications of this study could span pharmaceutical development of drugs that mimic or up-regulate protease activity to limit the adhesive abilities of both *S. cerevisiae* (as agents in diseases such as fungemia) and its fungal relative *C. albicans*, responsible for yeast infections and thrush.

BIO - 9 NUCLEOLIN AND ITS MUTANTS REGULATE SUB-NUCLEAR LOCALIZATION OF NUCLEOPHOSMIN

Latifa Pacheco (UN), **Shanan Cazaubon** (UN), **Brignel Camilien**(UN), & Anjana Saxena, Ph.D., Biology Dept, Brooklyn College, Brooklyn, NY

Nucleolin and nucleophosmin are the two major nucleolar phosphoproteins. Mobilization of certain nucleolar factors upon cellular stress like DNA-damage can lead to stabilization of the p53-tumor suppressor protein. Both nucleolin and nucleophosmin translocate to the nucleoplasm under DNA-damaging conditions to activate downstream tumor suppressor pathways that in turn can either cause cell-growth arrest or apoptosis (cell-death) in pre-cancerous cells.

Since sub-nuclear localization of these proteins is important; in the current study the localization of nucleolin, its mutants and nucleophosmin is assessed. Further, these proteins interact with each other during normal proliferative cell cycle. The study will not only indicate the nucleolin mutant/s altering the nucleophosmin localization but also provide clues for two nucleolar proteins that might act together or antagonize in cellular check-point activation/deactivation processes. Exogenously expressed various GFP-tagged constructs of nucleolin and immuno-stained endogenous nucleophosmin were simultaneously analyzed for their sub-cellular localization using fluorescent microscope. Our preliminary data suggest that the varied nucleolin domains are differentially localized in the nucleus and sometimes even in the cytoplasm. Assessment of nucleophosmin localization was varied with some forms of nucleolin mobilizing it more to peri-nucleolar or nucleoplasm.

In 35% of acute myeloid leukemia cases, a mutation in the nucleophosmin gene causes its cytoplasmic localization. This altered localization has been implicated in compromised tumor-suppressor pathways in such patients. Therefore, studying the factors (nucleolin in this study) that can alter sub-cellular localization of nucleophosmin has clinical relevance.

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BIO – 10 ALGAE TO BIOFUEL- ANNOTATION OF LIGHT HARVESTING COMPLEX PROTEINS IN THE GREEN ALGAE *CHLORELLA* NC64A USING COMPARATIVE GENOMICS

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Algae are photosynthetic organisms present in many domains of life. Algae are very diverse and grow relatively fast. This rapid growth of algae makes them good feedstock candidates for production of biomass, which is used to create renewable oil. Photosynthesis begins with the absorption of light by pigments bound to light harvesting complex proteins that convert solar energy into chemical energy in form of molecules. Some of these molecules made by algae can be used for oil production.

The goal of the project is to study light harvesting complex proteins in green alga *Chlorella* NC64A. A comparative genomics approach is used to annotate *Chlorella* NC64A genes by showing the similarities and differences with *Chlamydomonas*, which is a well-studied model organism. The work presented consists of determining the protein sequences and analyzing the genomic structure of *Chlorella* Light harvesting complex proteins. A genomic comparison between the different types of LHC proteins will be helpful in order to understand the different algae strains in their solar energy efficiency. Annotation of *Chlorella* genes is still ongoing work that requires further studies.

BIO – 11 PORPHYRIA CUTANEA TARDA (THE VAMPIRE DISEASE) TAKES A BITE OUT OF HEPATITIS B AND HEPATITIS C

Ashley M. Kalita (HS) & Janice Baranowski, Brooklyn Technical High School, Brooklyn, NY

Porphyria Cutanea Tarda (PCT) is a rare blood disease. The primary cause of this disorder is a deficiency of uroporphyrinogen decarboxylase (UROD), a cytosolic enzyme that is a step in the enzymatic pathway that leads to the synthesis of heme. Previous studies have estimated that 1 in

250,000 Americans has PCT. Genetic and non-genetic factors and the diagnosis of other blood related diseases were variables in determining how many Americans are infected with PCT. This analytical study looks specifically at Hepatitis B and Hepatitis C infections. It has been estimated that 1 in 8 Americans infected with Hep B has PCT and 1 in 6 Americans infected with Hep C has PCT. Using numbers from the CDC, the ratios stated above were calculated from 1982 to 2007, for the number of estimated PCT infections. The results show the prevalence rate of both Hep B and Hep C infections with PCT has decreased. The results also suggest the estimated number of Americans infected with PCT is smaller than estimated. This may be due to the fact that there are people not yet diagnosed. The only factors examined in this study were the blood related diseases, Hep B and Hep C. Future research should include the creation of a database to improve treatment options for patients with PCT.

BIO – 12 THE EFFECT OF PEPSTATIN A ON SISTER MUTANTS DCW1 and DFG5 FUNCTIONS IN *SACCHAROMYCES CEREVISIAE*

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DCW1 and *DFG5* are homologous genes required for the anchoring of GPI-mannoproteins to the fungal cell wall. A double disruptant of *DCW1* and *DFG5* is synthetically lethal. The functions of these gene products are redundant and at least one is required for cell growth. The class of cell wall proteins (CWPs) studied are GPI-mannoproteins - highly glycosylated polypeptides essential for cell wall integrity, anchored by glycosyl phosphatidylinositol (GPI). The study observes the effect of protease inhibitor Pepstatin A (PEPA) to analyze the enzymes involved in transporting GPI-mannoproteins from the plasma membrane to the cell wall. PEPA may act to enhance the sensitivity of GFP-Sag1 as a reporter by preventing shedding of aspartyl proteases from the wall in addition to lowering proteolytic activity and inhibiting aspartyl proteases. Concentration and fluorescence will be measured by observation of optical density and fluorimetry. This will determine growth rate and cell viability as dependent upon the presence/absence of PEPA. Out of this study, when sister mutants, *dcw1* and *dfg5*, are grown in the presence of the aspartyl protease inhibitor PEPA, we hope to see hyper excretion of the GPI-CWP reporter protein. This may be possible because with inhibition of "shedding" of aspartyl proteases, we can detect the GPI-CWP reporter protein with the action of PEPA. The applications of this study could allow for development of drugs which can regulate protease activity to limit the activity of adhesive cell wall mannoproteins of *S. cerevisiae* responsible for yeast infections and thrush.

BIO – 13 HOW ARE VEGETABLES AFFECTED BY THE TOBACCO MOSAIC VIRUS?

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This study aims to find out the effect of Tobacco Mosaic Virus (TMV) on vegetable leaves. In this experiment tobacco, distilled water, 0.1M dibasic potassium phosphate buffer, and three pots planted with tomato, cucumber, and green bell pepper seeds were used. After three weeks of the seedlings' growth, 3 different sections of each potted plant were treated with the following: (a) the buffer mixed with tobacco (actual source of TMV) as the experimental group; (b) buffer and distilled water for the negative control group; and (c) plain distilled water for the positive control group. We hypothesized that the TMV would cripple the growth of only the treated areas in the experimental section while the other two control groups would continue to grow normally with no effects. Observations were made ten days after treatment. In both the experimental and negative control groups, the leaves began to turn brown. The negative control group was not as greatly affected because it continued to grow whilst the experimental group's leaves began to shrivel up and stopped growing. We, therefore, conclude that TMV really affects plant leaves and that even if the potassium phosphate buffer caused damage to the plant, it is not as severe as when combined with the tobacco. Results of this study could be helpful in developing a TMV solution against harmful weeds that destroys agricultural crops. However, it is recommended that a further study must be done using tobacco and distilled water only to find out the sole effect of TMV.

BIO – 14 FUNCTIONAL ANNOTATION OF THE SEC-14 DOMAIN IN *ARABIDOPSIS*

Mohammed Abbasi (UN), Husna Shaik, Shaneen Singh, PhD., Brooklyn College Bioinformatics Lab, Brooklyn, NY

Our goal is to elucidate the structure of the sec-14 motif in *Arabidopsis* and how it may bind to phosphoinositide molecules. The sec-14 domain is ubiquitous in all eukaryotes. It is found mainly in phospholipid transfer proteins and plays various roles, including the transfer of phosphatidylcholine and phosphatidylinositol, control of phosphoinositide homeostasis and trafficking of vesicles, proteins and lipids from the golgi apparatus. Its structure and role has been researched extensively in yeast and other eukaryotes, yet not much has been studied about the domain in plants. In our study we have assigned secondary and tertiary structures to these domains found in *Arabidopsis*, which may not have been properly cited or recognized before. By using the sec-14 domain 1AUA from yeast which has been definitively modeled, we were able to model all of the sec-14 domains from *Arabidopsis* and show that its actual structure extends beyond that shown in conventional domain recognition programs. We also hypothesize that the sec-14 protein domains resemble 1AUA and therefore are able to transfer phosphoinositide molecules.

BIO – 15 IS BACTERIAL RESISTANCE A PRODUCT OF HORIZONTAL GENE TRANSFER OR CELL MEMBRANE PERMEABILITY?

Deon Marecheau (HS) & Barry Harvey, James Madison High School, Brooklyn, NY

Bacterial resistance, at its current rate, may increase in the future. Monitoring of the susceptibility status of important bacterial strains is required. New agents are also needed, especially for penicillin-allergic patients in pediatric patients. Bacterial resistance to antibiotics continually leads to therapeutic challenges among health care professionals. It is paramount that antimicrobial formulary selection and patient specific antibiotic therapies be based not only on efficacy, safety, and cost but also on the ability to fall susceptible to bacterial mutation. Antimicrobial usage is considered the most important factor promoting the emergence, selection and dissemination of antimicrobial-resistant microorganisms in human medicine. The aim of this study was to investigate the relationship between the effectiveness of antibiotics and show how gram positive, and gram negative staining could be used as an indicator of how a bacterium would react to a particular antibiotic. This study was conducted to show how different strains of bacteria react to different types of antibiotics. Four types of bacteria and four antibiotics were used in this study. The bacteria utilized in the experiment are *Staphylococcus Aureus*, *Acinetobacter*, *Micrococcus*, and *Lactococcus lactis*. The Four antibiotics used are Penicillin, Ampicillin, Erythromycin, and Neomycin.

BIO – 16 DOES CAFFEINE DECREASE THE ANTIMICROBIAL EFFECT OF ULTRAVIOLET RADIATION IN *SERRATIA MARCESCENS*?

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Studies at Rutgers University "have shown that caffeine applied to the skin of mice reverses ultraviolet induced damage and reduces skin cancer." This research attempted to determine if caffeine added to bacterial cultures protected the bacteria from the germicidal effects of ultraviolet radiation. *Serratia Marcescens* was the bacteria of choice since it produces a red pigment which is easily seen. Petri dishes containing sterile agar were prepared. Using a sterile swab *Serratia Marcescens* cultures were transferred to all dishes. The control group consisted of two dishes with the bacterial culture only and two dishes with four drops of a 2% solution of caffeine added.

The experimental group of petri dishes were the same as the control except those dishes were opened and placed in a sanitizing cabinet (containing an ultraviolet bulb) for one minute. The dishes were then covered. All petri dishes were incubated at room temperature for 48 hours. The dishes exposed to ultraviolet light and also containing caffeine showed much more bacterial growth than the dishes which did not have added caffeine. The added caffeine seemed to protect the bacteria from the harmful ultraviolet rays.

BIO – 17 IDENTIFYING BACTERIAL ISOLATES THAT DEGRADE WOUNDED SIGNALING MOLECULE ACETOSYRINGONE TO HELP REDUCE THE CHANCE OF INFECTION BY *AGROBACTERIUM TUMEFACIENS*

Laura M. Senatus (UN), Karla Dixon (UN), & Prof. Theodore Muth, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

Agrobacterium tumefaciens is a plant pathogen found in the soil. *Agrobacterium tumefaciens* targets wounded plant cells and is able to cause crown gall disease in a wide range of dicotyledenous plant hosts. *Agrobacterium tumefaciens* infects plant cells by integrating a part of its tumor inducing plasmid into the plant cell's genome. This causes the plant cells to undergo uncontrolled cellular division. Infection by *Agrobacterium tumefaciens* results in the production of enzymes that catalyze synthesis of auxin and cytokinin, plant growth hormones that are responsible for tumor growth, as well as directing the production of compounds called opines. Opines serve as a nutrient source for the infecting *Agrobacterium tumefaciens*.

Agrobacterium tumefaciens detects chemicals released by the wounded plants cells and uses flagellar-based motility to chemotax to the wound site. The most prominent virulence inducing compound is acetosyringone. Our primary aim is to identify and characterize bacteria in the soil that degrade, or sequester, the wounded signaling molecule acetosyringone, thereby not allowing it to diffuse into the soil at high enough concentrations to attract *A. tumefaciens* bacteria to the wounded site. In order to test and see what isolated soil bacteria will reduce virulence of *Agrobacterium tumefaciens*, it is important to use the acetosyringone virulence signal to induce the bacteria and then test what bacterial isolates inhibit the virulence induction. Finding these bacteria through these means may help reduce the chance of infection by *Agrobacterium tumefaciens* and this plant pathogen's ability to recognize and interact with the plant cell.

BIO – 18 DOES MAYONNAISE RETARD THE GROWTH OF BACTERIA IN FOOD?

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It is thought that mayonnaise was the cause of food spoilage, but recent studies proved it to be false. Foods that are mixed with mayonnaise and vegenaïse are left unrefrigerated in petri dishes. After waiting for 48 hours, a sample of the food was transferred to a petri dish containing sterile agar by using a sterile swab. These dishes were then incubated at room temperature for another 48 hours. After numerous trials, the bacterial growth in the dishes containing and vegenaïse had considerably less growth. Compared to the control, there was a 1.5 less bacterial growth in foods containing vegenaïse and 2.5 less bacterial growth in foods containing mayonnaise. The reduced growth may be attributed to the vinegar presented in the mayonnaise and vegenaïse.

BIO – 19 THERAPEUTIC POTENTIAL OF GARLIC EXTRACTS IN THE TREATMENT OF ALS AND ASSOCIATED NEURODEGENERATIVE DISEASES

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Today, Cadmium (Cd), a natural element found in the earth's crust, has become a widespread pollutant due to human activities such as mining. Many Cd-related pathologies have increased. Cd causes oxidative stress by indirectly causing the production reactive oxygen species (ROS) that increases lipid peroxidation and alters the levels of glutathione (GSH). The goal of this study was to determine whether garlic powder extract and two active components of garlic, diallyl disulfide and diallyl sulfide, can protect motor neuron-like cells against Cd-induced neurotoxicity. Pretreatment of cells with garlic compounds seemed to be at first toxic to the cells. Cell viability of cells that were pretreated with garlic compounds were lower than cell viability of cells that were treated with Cd only. At low concentrations of Cd, DAS was less toxic and conferred more protection against Cd-induced toxicity than the other garlic compounds. At high concentrations of Cd, however, DADS was less toxic and conferred more protection.

BIO – 20 Characterizing Microtubule Dynamics under osmotic stress

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The dynamic instability of microtubules is essential for proper segregation of chromosomes during mitosis. Drugs that either stabilize or destabilize microtubules can preferentially target cancerous cells that proliferate rapidly. Our laboratory demonstrated that microtubules in yeast cells could be stabilized in vivo by growing the cells under hyperosmotic conditions. This is probably the result of higher cytosolic viscosity due to an increase in intracellular glycerol concentrations mediated by the Hog1 MAP kinase pathway. In order to further characterize the effect of hyperosmotic conditions on the dynamics of microtubules we will generate a yeast strain that carries a GFP- β -tubulin and mCherry-Bik1 fusions. The Bik1 protein localizes to the plus-ends of microtubules and marking it red in cells with “green” microtubules. This facilitates the analysis of cytoplasmic microtubules that exhibit a high degree of dynamic instability throughout the cell cycle in cells subject to osmotic stress compared to normal conditions. These studies will expand our understanding of the effect of suppressing dynamic instability on mitotic events.

BIO – 21 POTENTIAL ROLE OF YAPSINS IN CELL WALL INTEGRITY OF *SACCHAROMYCES CEREVISIAE*

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Yeast aspartyl proteases (Yapsins, YPS) play an important role in the digestion of many proteins of *Saccharomyces cerevisiae*, particularly those peptides with monobasic and dibasic sites. We have taken YPS mutants of *S. cerevisiae* and transformed them with a plasmid that codes for a GFP-tagged mannoprotein (which lies on the outer-most part of the cell wall). In preliminary studies, we see a deficiency or irregularity of the cell wall in particular YPS mutants, and believe to see the same effect during growth. These particular YPS mutants may play an important role in cell wall integrity and could be potential targets for new anti-fungal remedies.

BIO – 22 ANALYZING MOSQUITO MIDGUT METAMORPHOSIS USING RNAi

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Mosquitoes are vectors of microbes and viruses that cause diseases such as malaria, dengue and yellow fever. Mosquitoes are hematophagous insects, and they transmit the viruses and microbes from one person to the other. One way to reduce the number of mosquito-borne disease is by studying mosquito metamorphosis. Having a clear understanding of mosquito metamorphosis will help to improve insecticides to be directed towards mosquitoes and not to other organisms. During the 4th, instar metamorphosis is initiated and it involves a remodeling of the midgut, in which diploid cells replicate to form the adult epithelium and polytene cells undergo apoptosis. The transcription factor HR3 is expressed early during metamorphosis. Real time PCR was performed to quantify the expression of HR3 during metamorphosis. The real time PCR results show that HR3 is expressed 24 hours after the last larval-larval molt. Then, 48 hours after the last larval-larval molt there is a peak of expression of HR3. According to our results, we hypothesized that HR3 may have a central role during metamorphosis. In order to test our hypothesis, we knocked down the transcription factor HR3 by using the technique of RNAi. Fourth instars were injected with HR3 dsRNA from 0-12 hours after the last larval-larval molt. Another set of 4th instars were injected with HR3 dsRNA from 12-48 hours after the last larval-larval molt. The results show that 4th instars injected with HR3 dsRNA from 0-12 hours after the last larval-larval molt have morphological defects. Morphological analysis shows that injected larvae had defects in cuticle formation and midgut metamorphosis. The pupae resulting from injection with HR3 dsRNA could not develop a cephalothorax, did not have a complete pupal pigmentation, and could not detach from the larval cuticle. The results also showed that polytene cells did not undergo programmed cell death. There were pupae resulting from injection with HR3 dsRNA that did not have midgut remodeling because the gastric ceaca was not removed from the pupal midgut. We quantified the expression of HR3 from 4th instars injected with HR3 dsRNA 24-48 hours after the last larval-larval molt. The real time PRC results show that the expression of HR3 decreases

by 8 fold. These results suggest that injection of HR3 dsRNA seems to have some effect in the remodeling of the midgut. Our future plan is to optimize conditions of injection, in situ hybridization studies, and Bromodeoxyuridine (BrdU) incorporation to analyze which cells are present. We also plan to do RNAi for knockdown of other transcription factor genes. We hope that our investigation will be useful to improve mosquito insecticide and decrease the number of humans dying of malaria, yellow fever, and dengue fever.

HNS – 1 DIET AND THE RISK OF DEVELOPING TYPE 2 DIABETES IN CHINESE ADULT MALES

Jenny Tse (HS) & Janice Baranowski, Brooklyn Technical High School, Brooklyn, NY 11217

Diabetes afflicts almost 24 million Americans and the most common form is type 2 diabetes, a disease associated with high levels of blood glucose. Previous studies have examined the influence of diet on the risk of developing type 2 diabetes. Foods such as whole grains and nuts have been shown to decrease the risk and diets containing sugar-sweetened beverages and foods made with refined flour have also been related to an increased risk. Studies in the United States have mainly examined white and black populations with few studying other ethnicities. This study examined a Chinese-American adult male population and the relation between their diets and their risks for developing the disease. Data was obtained through surveys with questions about health information and a food frequency questionnaire (FFQ). Results demonstrate consumption of alcohol, sweetened beverages, and baked desserts are directly related to the risk of developing type 2 diabetes. Therefore, the study had similar findings to past research. These results may influence the diets of the Chinese population and future studies should examine other ethnicities to provide ethnicity-specific data.

HNS – 2 CAN RESVERATROL INCREASE THE RATE OF METABOLISM IN YEASTS CULTURES?

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Resveratrol is an ingredient in red wine, which recently has been found to reduce glucose levels in diabetic patients. This research project was developed to test whether resveratrol will increase glucose metabolism in yeast cells. Yeast, glucose and water were poured into two calibrated fermentation tubes. One of the tubes also contained 50mg of resveratrol. The production of CO_2 in the tubes was timed over a 150 minute period. In all trials, the addition of resveratrol sped up the time it took for CO_2 to reach 5ml in the experimental fermentation tube (14.7%). Since the production of CO_2 in the yeast glucose solution is a product of glucose metabolism, the increased rate of CO_2 production indicates the speedier breakdown of glucose. In the trials conducted so far, the addition of Resveratrol increased metabolism in yeast cells.

HNS – 3 PORPHYRIA CUTANEA TARDA (THE VAMPIRE DISEASE) TAKES A BITE OUT OF HEPATITIS B AND HEPATITIS C

Ashley M. Kalita (HS) & Janice Baranowski, Brooklyn Technical High School, Brooklyn, NY

Porphyria Cutanea Tarda (PCT) is a rare blood disease. The primary cause of this disorder is a deficiency of uroporphyrinogen decarboxylase (UROD), a cytosolic enzyme that is a step in the enzymatic pathway that leads to the synthesis of heme. Previous studies have estimated that 1 in 250,000 Americans has PCT. Genetic and non-genetic factors and the diagnosis of other blood related diseases were variables in determining how many Americans are infected with PCT. This analytical study looks specifically at Hepatitis B and Hepatitis C infections. It has been estimated that 1 in 8 Americans infected with Hep B has PCT and 1 in 6 Americans infected with Hep C has PCT. Using numbers from the CDC, the ratios stated above were calculated from 1982 to 2007, for the number of estimated PCT infections. The results show the prevalence rate of both Hep B and Hep C infections with PCT has decreased. The results also suggest the estimated number of Americans infected with PCT is smaller than estimated. This may be due to the fact that there are people not yet diagnosed. The only factors examined in this study were the blood related diseases, Hep B and Hep C. Future research should include the creation of a database to improve treatment options for patients with PCT.

HNS – 4 HIGH LEVELS OF INTRAMYOCYELLULAR LIPID AND VISCERAL FAT INHIBIT GLYCEMIC CONTROL IN OBESE RATS

Ann Glassman (UN), Kirsten Mimberg, Kathleen Axen, Kenneth Axen, Department of Health and Nutrition Sciences, Brooklyn College-CUNY, Brooklyn, NY 11210

Intramyocellular lipid (IMCL) content in skeletal muscle is abnormally high in conditions of obesity, type 2 diabetes, insulin resistance (IR), and other metabolic disorders. This study observes the relationship between IMCL, glucose tolerance, and body composition. We compared the effects of 4 isocaloric, energy-restricted diets on body composition and glycemic control in 26 male Sprague-Dawley rats for 8 weeks. Obese weight-matched groups were fed one of four diets: VLC-HF rats ate a very low-carbohydrate, high-fat diet (5%C, 60%F, 35%P); VLC-HP rats ate a very low-carbohydrate, high-protein diet (5%C, 45%F, 50%P); HF-R rats ate a restricted-calorie, high-fat diet (15%C, 60%F, 25%P); and HC rats ate a high-carbohydrate, low-fat diet (60%C, 15%F, 25%P). Food intake and body weight differences between groups were negligible ($p=0.244$, $p=0.198$). VLC-HP rats had greater visceral and total fat pad masses than those from VLC-HF, HF-R, and HC rats ($p<0.05$). All groups produced similar glucose responses to a glucose tolerance test ($p=0.174$), however responses varied within the groups ($p=0.000$). There is a positive correlation between IMCL levels and the area under the curve for the GTT ($p=0.0004$). Poor controllers of blood glucose displayed greater IMCL, visceral and total % body fat than good controllers of blood glucose. These findings show a direct correlation between visceral fat, IMCL, and IR. Increased consumption of dietary lipids ultimately leads to IR.

HNS - 5 METABOLIC EFFECTS OF LOW-CARBOHYDRATE WEIGHT REDUCTION DIETS IN RATS

Oluwafunmilayo Bomide (UN), Adrienne Davidson, Ann Glassman, Michael Griesinger, Kirsten Mimberg, **Yinka Olufawo**(UN), Julie Roddy, Department of Health and Nutrition, Brooklyn College-CUNY, Brooklyn, NY 11210

Obesity has been linked to insulin resistance and the development of Type 2 Diabetes (T2D). Individuals with T2D have been shown to have impaired mitochondrial function. Carnitine is a small nitrogen containing compound produced in the livers and kidneys that is required to transport fatty acids into the mitochondria for lipid oxidation. Diets supplemented with carnitine have been shown to enhance lipid oxidation and to reduce insulin resistance. The purpose of our study is to show that low carbohydrate diets has an effect on weight reduction. Our subjects are male Sprague-Dawley rats. From week 1-8, the rats were divided into two groups; the control (C) group and the High Fat (HF) group. The C group's diet was composed of 60% carbohydrate with 15% fat while the HF group's diet was composed of 15% carbohydrate and 60% fat. Based on our analysis, it is evident that the C group has less body weight than the HF group and as a result their glucose tolerance test corresponds with their weight in which the blood glucose for the HF group was higher than the C group. In our study, we established that our obese group has impaired glucose tolerance which was shown to be due to insulin resistance. The glucose tolerance test showed that the glucose levels differed at 20 minutes and at 30 minutes. From week 9-12, we then divided the animals into three calorie-restricted groups; The group with HF diets with 60% fat but restricted calorie, the group with very low calorie (VLC) with 5% carbohydrate and 60% fat, the high calorie (HC) group with 60% carbohydrate and 15% fat. Each group was subdivided into two groups; the groups with carnitine in their diet (+ Carnitine) and the groups without carnitine in their diet (- Carnitine). Our hypothesis is that treatment with carnitine will improve insulin resistance in groups receiving HF diets.

HNS - 6 THE EFFECT OF LIFE STYLE AND STRESS ON BIOLOGICAL AGE

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Modern society is at its highest point concerning human health. Not only are there risk factors that are affecting people's health, but also it is getting harder and harder for individuals to keep up their health. Recent studies showed that people in urban areas tend to have more heart related diseases and diabetes than people in rural areas.

A study was done involving 176 people of age range 20-40 years. The data collected included their blood pressure, Body Mass Index (BMI), weight, and fat percentage. These people were given questions concerning their life habit, like smoking, exercise and diet to determine their health condition and stress level.

From the data collected the chronological age and biological age of each individual was compared and represented in graphs. The research proved that factors as stress of everyday life, poor diet, and lack of exercise contribute to heightened biological age, therefore shorter life.

HNS – 7 SKIN AND RESPIRATORY CONDITIONS IN THE RUBBER MANUFACTURING INDUSTRY

Janille Jumalon (HS) & Ms. Janice Baranowski, Brooklyn Technical High School, Brooklyn, N.Y.

Skin diseases and respiratory ailments are common drawbacks in most manufacturing jobs. Especially in the rubber manufacturing industry, these conditions are prominent due to the chemical exposures found as a byproduct of rubber merchandise fabricated. One such chemical is 1,3 butadiene, a simple reagent for creating synthetic rubbers such as tires, moldings and thousands of other products. 1,3 butadiene is known to be a possible carcinogen and its effects can be detrimental to human health when overexposed. In this study, the relationship between skin diseases and respiratory ailments are investigated

HNS – 8 PARENTAL PERCEPTIONS OF THE ROLE OF DIET IN CHILDHOOD ASTHMA: RESULTS OF A PILOT STUDY

Amanda Brick (UN), Elana Ganopolsky (UN), Thomas A Lewandowski, Health and Nutrition Sciences, Brooklyn College-CUNY, Brooklyn, NY 11210

Diet may play an important role in the frequency and severity of asthma attacks. To better understand the dietary decisions made by parents of children with asthma and other allergies, we administered an oral questionnaire to 72 New York City residents encountered in Central Park (CP, n=38) and in Coney Island (CI, n=34). Subjects were identified by convenience sampling. Sixty-four percent of subjects reported that their child had asthma. In terms of triggers for their child's asthma, the most frequently offered responses were 'weather' (52%), "infection" (46%), "pollution" (37%), and "food/drinks" (30%). Differences between CP and CI were not statistically significant. Only 15% of parents reported avoiding particular foods which they felt triggered their children's asthma (13% in CP and 16% in CI). Milk/dairy and nuts were the most frequently reported foods that were avoided. When questioned about food allergies (as opposed to asthma specifically), 38% percent of parents overall reported a food allergy in their children (CP - 55%, CI - 18%, $p < 0.001$). Compared to earlier studies, our results suggest a lesser tendency on the part of parents to use dietary adjustments to control their child's asthma. Parents in NYC may therefore benefit from education on the relationship between diet and asthma. Any educational program should inform parents not only what foods may serve as asthma triggers but also which foods, such as oil fish, may be beneficial. A larger scale investigation, one involving several hundred children, would constitute a logical follow-up to the pilot study.

HNS - 9 AVIAN INFLUENZA H5N1 AROUND THE WORLD

Anthony Yam (HS) & Janice Baranowski, Brooklyn Technical High School, Brooklyn, NY

Influenza H5N1 is a possible pandemic virus. It is necessary to understand its behavior in both human and poultry populations so that a relationship may be established between the two populations. The goal of this research is to look for correlation between human data and poultry data so that a link between the two may be found. Data were gathered from medical journals and archives from the World Health Organization (WHO), World Organization for Animal Health (OIE) and the Center for Disease Control (CDC) and compiled onto a Microsoft excel spreadsheet. These data were then sorted into two categories human or poultry data. Several charts were then formed based on the data and compared to see for any similarities. The results that were found indicated a possible relationship

between the numbers of poultry outbreaks in comparison to the numbers of human cases. No other distinct relationship was found. In conclusion, the number of outbreaks increased the chances of the spread of influenza H5N1 from the poultry population to the human population. Further studies are needed to be performed when more data are available about this virus and how it affects the human and poultry population. If a more distinct relationship is found between the human and poultry population, further spread of the virus from poultry to human population can be prevented.

HNS – 10 ARE WE DRINKING OUR WAY TO HEART DISEASE?

Jermaine B. Heath (H.S.) & Ms. Janice Baranowski, Brooklyn Technical High School, Brooklyn

Cardiovascular disease (CVD) includes some of the most life-threatening conditions known to humankind. In addition to poor lifestyle choices, the level of synthetic hormonal compounds in the environment may increase the risk of CVD in males. Today, hormones, and more specifically, active pharmaceutical ingredients (APIs) are present in the water supply at significant concentrations. The objective of this research was to investigate how significant a role these APIs played in the development of CVD in older men. Using public information about incidence and prevalence of CVD in various areas of the United States, trends that compared the concentration of hormones that were chemically similar to testosterone to a man's risk of developing a specific type of CVD was observed. It was observed that some states that reported higher levels of endocrine disrupting compounds in the water supply had higher rates of CVD when compared to the national incidence of CVD. While other factors may play a large role in the incidence and prevalence rates of specific types of CVD, these findings suggest that there may be a significant link between the concentration of pharmaceuticals in the environment and the rates at which males develop CVD. This research is only preliminary and must be conducted again, more in-depth, as the findings of this study may have a detrimental effect on everyone in a society.

HNS – 11 MEDICAL TOURISM: AN IMMINENT CONCERN

Jasmine Patel (UN), Brooklyn College-CUNY, Brooklyn, NY 11210

Medical tourism, the practice of traveling internationally to obtain medical treatment, grew at a rate of 20% in 2007 and the number of medical tourists is expected to climb to 6 million in 2010. This is a growing concern for domestic United States surgeons as well as the healthcare system considering the population of patients is beginning to decline. Consumers include patients primarily from developed nations including the United States who are taking advantage of the comparative advantage in price, rapidity, quality, privacy, and recreation of medical services in developing nations. These destination nations include Brazil, India, and Thailand. The private hospitals there dedicated to medical tourists found a profitable niche taking advantage of globalization and low transportation costs. They have even combated the fear of lack of quality by attracting US trained personnel and applying for Joint Commission International accreditation. However, the local population loses valuable medical services and personnel to this profitable industry leaving it with an underfunded and understaffed public health system. Problems arise even in developed nations where in order to stay competitive, the price of comparable surgeries will have to be lowered or the quality improved to be worth the price. Ultimately, government regulation will have to be enacted. Already, for example in India, local governments have made agreements with private hospitals to cut property taxes if a quota of the local population is serviced. In the United States especially, the holes in our health system must be fixed if we are to compete in this rapidly globalizing world.

HNS – 12 EFFECT OF STRESS ON GLUCOSE LEVEL IN DIABETICS

Jonathan Jean-Pierre, (HS), Frances Fisher, FDR High School

Diabetics are always stressed and wonder what causes them to become stressed. This project looks at diabetics' blood for the answer. Blood contains different levels of glucose from the food digested by the diabetic, to what type of hidden viruses wonder around their bodies. Blood can be further tested to find causes of unknown symptoms like stress from the cells in the blood.

For this project to advance, this experiment needed a participant with diabetes for this experiment could go any further. After informing the participant, her blood was used to further analyze a solution for her unknown symptoms of stress. Her blood was tested everyday, before and after she ate, for a series of weeks. Before testing her blood, she would perform her usual activities and would briefly describe any conflict she experienced at work, home, and school. She would then, write down the level of her glucose level and how she felt before and after she tested her glucose level.

The hypothesis is that there is a high amount of glucose being stored in the blood, causing the cells to work overtime to try to absorb the huge amount of glucose left in the blood. By testing this idea, the results of this experiment and research can prove that the hypothesis of the experiment is true. Thus, this experiment can help find a treatment in lowering stress levels and help breakdown the glucose in the blood.

PEES – 1 THE OCCURRENCE AND PREVALENCE OF INJURY IN PSAL FENCING AND METHODS OF PREVENTION

Sean Dhanraj (HS) & Mrs. Janice Baranowski, Brooklyn Technical High School, Brooklyn, NY

Fencing is an open combat sport that is played both nationally and internationally. It is a sport where physical skill is combined with mental prowess. Foil fencing emphasizes the action through rules and limited target space on the trunk of the body. Though fencers wear protective gear, they are subject to multiple injuries. Little data exists that analyzes the injuries of fencers and offers methods of prevention. Thirty fencers were recruited from the Public School Athletics League (PSAL), both boys and girls, and asked to fill out a survey that recorded the number of and often they sustained injuries while both fencing competitively and during practice. In addition, the survey asked for the severity of the injury and asked for the number of hospital visits made. The fencers were asked about where they sustained their injuries and why they felt the injury had occurred. Results from the thirty fencers were analyzed for consistency and qualification, and graphed. It was found that less than 30% of fencers suffered major injuries while fencing, and that there were a larger number of recorded injuries in tournaments. In addition, the numbers of minor injuries per person were high. Most of these injuries could have been prevented. Injuries can be avoided in PSAL fencing if it becomes mandated to fence in experience-fixed tournaments, to wear all and more protective gear, and to both stretch out sufficiently and warm up effectively before any fencing action.

ENV SCI - 1 THE OXYGENATION OF MARSH WATER BY *PHRAGMITES AUSTRALIS* PHOTOSYNTHESIS

Melanie Srour (HS) & **Albert Azar** (HS), & Mr. Steven Kaye, Magen David Yeshiva High School, Brooklyn, NY 11214

Phragmites is a large reed found in wetlands throughout the world. It is regarded as the sole species of the genus Phragmites and called *Phragmites australis*. It is described as being two to four meters tall with heavy, leaf-blades wide branches and densely flowered spikes that appear as sharp long hairs. Phragmites is considered responsible of biological invasions and major changes in plant communities. As Phragmites spread, colonization occurs in linear clonal growth or circular clonal growth which is a spontaneous non-directional spread. Most patches occur within five meters of water. Prior research has shown that Phragmites has the ability to release photosynthesis oxygen through its roots and experiments were performed in vitro using artificial growth media.

Phragmites were grown in an aquarium using marsh sediment and water. Dissolved oxygen levels were measured under photosynthesis and non photosynthesis conditions: no light, low light and bright light. Water without Phragmites was used as a negative control and water containing the aquatic plant, Anacharis, was used as a positive control. The results confirmed that under light, Phragmites' roots oxygenate the sediment in which they grow. It was also found that when the roots remained submerged for extended periods of time, oxygenation stopped. This appears to have been due to the filling of the hollow rhizomes with water preventing the internal gas pressure from reaching the roots.

Although considered a harmful exotic in NYC parks, this research suggests that Phragmites is beneficial to marsh environments and creates conditions supportive to marine life.

ENV SCI – 2 THE EFFECT OF ROUNDUP, AN HERBICIDE ON INVERTEBRATES, EARTHWORMS AND THE ECOLOGY

Ezra Pichotto (HS) & **Alberta Weingort** (HS), & Mr. Steven Kaye, Magen David Yeshiva High School, Brooklyn, NY 11214

Roundup is an herbicide that is currently being used in the New York City parks, to the displeasure of many people in the area. Although this herbicide is not considered to be highly toxic, published research suggested that it is lethal to frogs and toads. When large quantities of Roundup were applied to land in Canarsie Park, observations suggest that the entire ecosystem was destroyed.

Roundup is the brand name for glyphosate which is an herbicide. Studies have shown that roundup is more toxic to frogs and toads. The United States EPA has concluded that glyphosate is non carcinogenic but other studies suggests that it causes genetic damage not due to the glyphosate by itself but due to 'another ingredient in the herbicide mixture.

An experiment was designed to test the effects of Roundup on Daphnia Magna, which was used as a bioassay. Daphnia is often used as an indicator species to test toxins on the environment and it responds quickly to its environment. Solutions were prepared containing various concentrations of the herbicide in water. Daphnia were introduced and observed after twenty four hours to determine the minimum concentration that would be lethal. Daphnia were added to water without the herbicide as a control. Additional experiments were performed by applying the herbicide to soil containing earthworms.

The results suggest that this herbicide is toxic to invertebrates and earthworms to a greater extent than is suggested by the parks department.

ENV SCI – 3 ENZYMATIC DEGRADATION OF POLY-PENTADECALACTONE (PPDL) USING MICROORGANISMS FROM SOIL SAMPLES

Saila Mukta (HS) & Professor Richard Gross, Brooklyn Technical High School & Professor of Biological and Chemical Sciences Polytechnic University of NYU

The increased use of plastic has resulted in conflict when dealing with its method of disposal. Two common methods of disposing of plastics are incineration and dumping, both of which are hazardous. Previous research has discovered biodegradable polymers which lack desirable qualities similar to polyethylene. The purpose of this study is to find an enzyme to degrade the biodegradable polymer, polypentadecalactone (PPDL) which contains desirable qualities such as high melting point and is easily synthesized.

This study began with the collection of soil samples from New York and New Jersey. These samples were enriched with basal salt medium. After an incubation period of 2 to 3 weeks, several agar plates showed clear zones around colonies. To identify the isolated microorganism, their properties were tested and then purified.

From all of the samples, 7 isolates were extracted and isolated. PPDL film degradation was measured periodically. Recently two new isolates have been found and further studies are being conducted on these isolates.

Finding an enzyme to degrade poly-pentadecalactone will be useful for the environment since its products are natural. Eventually, this will lessen the effects of greenhouse gases and decrease rates of many prevailing diseases.

ENV SCI – 4 STATUS AND DEVELOPMENT OF WASTEWATER TREATMENT PLANTS IN GREECE

Christina Kostopoulou (UN) & Professor Micha Tomkiewicz , Brooklyn College, Environmental Science Department, Brooklyn, NY

Lakes and seas in Greece are currently under severe stress because of water pollution. One of the most popular methods used in the country to address the water pollution is the construction of Wastewater Treatment Plants (WTP) which even though, in most cases, are funded from the European Union and the Government but administered by the public local agencies. One of the biggest issues is that a significant number of the plants are either malfunctioning, or have never been operated, resulting to a waste of both capital and land. The purpose of this paper is to make a Life Cycle Analysis (LCA) of major WTP in Greece and compare those that failed with those that operate successfully. Part of this comparison will be an assessment of the effectiveness of the agencies involved. The current technological methods that are employed in WTP will be also discussed in terms of the special needs of specific regions, which include not only the kind of wastewater that needs to be managed and the extend of pollution that needs to be controlled, but also the economic environment that will secure the uninterrupted operation of a WTP. The affluence of the local communities seems to be a key factor in the proper operation of WTP because, after the construction has been completed, the operation and maintenance costs of the plants are funded from the community. The data presented in this paper has been collected from previous researches of the status of WTP in Greece and other Mediterranean countries. Analysis and interpretation of this data is based on the water standards imposed by the European Environmental Agency.

ENV SCI – 5 CAN THE PERFORMANCE OF SOLAR PANELS BE IMPROVED WITH THIN FILM REFLECTIVE MATERIAL?

Mike Saadia (HS), **Lew Esses** (HS), **Eddie Sitt** (HS) & Mr. Kaye, James Madison High School, Brooklyn, NY

Mylar space blankets were obtained. In initial experiments spotlight was directed onto the blankets to see how it reflected light. Previous research stated that space blankets reflect 97% of radiant energy. Test performed with a light meter confirmed that they are highly reflective. A parabolic shape cardboard frame was designed and the Mylar was bonded to the frame using spray adhesive. The completed reflector was positioned to direct the sun's rays onto a large photovoltaic solar panel.

The performance of the solar panel with or without reflective Mylar was determined through the use of a volt meter. We found a significant increase in the output voltage and the length of time when more sunlight was directed onto the panel. The experiment confirmed that the efficiency of photovoltaic

panels could be increased through the use of reflectors which could reduce the cost of installing photovoltaic systems.

ENV SCI – 6 MARSH GRASSES AND SOIL COMPOSITION IN THE DEGRADATION OF JAMAICA BAY SHORELINES

Sam Sirotnikov (HS), & Mr. Steven Kaye, James Madison High School, Brooklyn, NY

Walks along the shoreline of Jamaica bay led to observations of the marsh grasses. Observations revealed that *Spartina alterniflora* and *Phragmites australis* grow in close proximity; *Spartina* is considered to be desirable and *Phragmites* is identified as an invasive exotic. Researchers have shown that *Phragmites* served to oxygenate the soil, suggesting that a relationship may exist between the two species.

Recent reports place blame for degradation of the marshland on sewage pollution, yet observations indicate the replacement of organic rich sediments with sand. Surveys of growth patterns and soil tests document that the loss of organic matter possibly caused by changing sea levels, may be contributing to the loss of soil and demise of the marsh.

ENV SCI – 7 Env Sci – 7 EVIDENCE FOR GLACIO - ISOSTATIC DEFORMATION IN GERRITSEN INLET, BROOKLYN, NEW YORK

Shadman Torofder (HS) & Mr. Steven Kaye, James Madison High School, Brooklyn, NY

A shoreline containing three distinct horizontal strata of shell fragments was discovered along the west shore, Gerritsen Inlet, Brooklyn NY. Comparisons of photographs of this site with fossil shell layers in Iceland showed similarities. A topographic map of Brooklyn, dated 1897, prior to extensive landfill and dredging of the Inlet indicated a small projection of land with higher elevation extended into the marsh. As this site is part of the glacial outwash plain, a link to the Wisconsin glaciations was hypothesized. Sediment samples from layers surrounding the fossil shells indicate glacial outwash deposits. The elevation of these layers strongly suggests subsidence and uplift occurred. As existing literature indicates no glacial deformation here, this new finding contributes to our understanding of glacio-isostatic deformation.

ENV SCI – 8 THE EFFECT OF RED WORMS *EISENIA FOETIDO* ON POLYLACTIC ACIDS MATERIALS

Tiyi Brewster (HS) & Mike Duggan, Brooklyn Academy of Science and the Environment, Brooklyn

In this study, *Eisenia foetido* were used to test the biocompostability of polylactic acid materials created from natural sources. Using the model of the home composting system¹, the decomposition rate of four compostable materials- heat resistance fork, non-heat resistance fork, biocompostable cups and degradable plastic bags-were tested. In addition to a control group, there were three experimental treatment conditions for the materials used: heated, frozen and “normal”. It is hypothesized that the invertebrates used should break down these materials into the ingredients necessary for soil health. The loss of material mass supports the degradability of these products. This information can help home composters determine the benefits, or harm, of putting these materials in their bin. In addition, the ability of these materials to be composted in home compost systems could reduce the amount of waste that is sent to hundreds landfills around the world.

ENV SCI – 9 BEASTY BACTERIA: RESISTANCE IN BACTERIA TO ANTIMICROBIAL CLEANING PRODUCTS

Taha Hatab (HS) & Shoshana Berkovic, New Utrecht High School, Brooklyn, NY

Different antimicrobial cleaning products were tested to see which would be most useful in eliminating harmful household bacteria because they result in the least resistance. It was assumed that many products, when used regularly, would result in the selection for resistant bacteria, and would therefore be less useful in controlling bacteria.

Sterile cotton tip applicators were used to contaminate nutrient agar plates with a sample of bacteria from different surfaces in my home. In each plate five sterile paper disks, four soaked in different

cleaning products, and one in distilled water (the control), were evenly spaced. Colonies suspected to be resistant were re-cultured in new plates along with a paper disk soaked with the product they were resistant to.

All but one of the cleaning products tested effectively inhibited bacterial growth; no bacterial colonies were found near the disks soaked with these products. There were two colonies found growing next to the Palmolive® detergent disk in the kitchen sink culture. When each colony was transferred to a new dish with a disk soaked with the detergent, one colony demonstrated a slight sensitivity to the detergent while the other demonstrated complete resistance to the detergent; it grew over the entire area of the dish.

Our results show that Palmolive® dish detergent cannot be relied on to effectively kills all bacteria. An alternative product should be used to eliminate bacteria in the kitchen sink. The other products we tested can be relied on to control bacterial growth in the home.

ENV SCI – 10 DESALINIZATION-WATER FOR THE AMERICAN SOUTHWEST

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The process of desalinization is being considered as a significant future contributor to the current U.S. water supply. The American southwest is under a significant amount of pressure to obtain a fresh water supply and current desalination plants being constructed in California may offer some solutions. Presently water from the Colorado River serves major populated areas such as Los Angeles, Denver, Phoenix, Las Vegas and Albuquerque. Drastic reductions in water levels affect major cities in the Southwest, which draw their water from the Colorado-fed Lake Mead. Within the last decade water levels in Lake Mead have dropped over 100 feet. Researchers estimate that Lake Mead has a 10% probability of running dry inside of 6 years and if changes are not made to the amount of water consumption a 50% possibility that the reservoir will run dry by 2021. The purpose of this project is to understand the environmental impacts of desalination and examine approaches to reduce these impacts; also to understand the approaches made to lower the financial costs of desalination so that it is a smart option compared to other alternatives in areas where established sources of water are inadequate. This project will also examine if these new technologies can help sustain a future water supply for the growing population. Data collected for this paper is gathered from the Southern Nevada State Water Authority along with previous research done to recognize the feasibility of desalination as a water source.

ENV SCI – 11 DEVELOPING WATER RESOURCES IN AFGHANISTAN FOR AGRICULTURE

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Afghanistan, one of the poorest nations in world with an economy that is heavily dependent on agriculture and livestock, has 80% of its population living in rural areas and dependent on natural resources as a source of sustenance. Decades of conflict caused a decline in agricultural productivity to a level of subsistence farming. Developing water resource for agricultural will provide immediate income and food security. The Afghanistan Ministry of Agriculture, Irrigation, and Livestock (MAIL) has drafted an Irrigation Program that outlines the development of irrigation while preventing environmental degradation. An evaluation was conducted to assess the development of water resources for agriculture and if the irrigation objectives outlined by MAIL has been met. The World Bank is facilitating government programs worth \$100 million for the rehabilitation and expansion of irrigation systems. The semi-annual reports issued by the World Bank show an increase in the amount of irrigation projects in the past three years and the establishment of six local institutions for the regulation of water supplies. The World Bank irrigation projects are meeting the objectives of MAIL by increasing irrigated cropland and increasing institutional capacity. There has yet be a significant amount of effort in adopting biological erosion controls to prevent siltation of downstream irrigation schemes. Furthermore, data from the United Nations Office of Drugs and Crime (UNODC) showed that agricultural assistance did not have a significant impact on the cultivation of poppy/opium.

ENV SCI – 12 DEVELOPMENT OF SUSTAINABLE LOW-INCOME HOUSING

Ankuri Desai (UN), **Sara Tariq** (UN), **Zujaja Tauqeer** (UN), & Micha Tomkiewicz, Department of Environmental Studies, Brooklyn College-CUNY, Brooklyn, NY 11210

This study intends to analyze the energy consumption and sustainability efforts of low-income housing in Queens, NYC. The borough of Queens is home to the most low-income housing developments in New York City and since research has shown that a disproportionate amount of environmental degradation is done by lower-income, urban areas, sustainability efforts in affordable housing are imperative. This study considers the green initiatives already taken by New York City Housing Authority (NYCHA), such as the Hot Water Storage Tank Replacement Program, which will reduce more than 53 million pounds of carbon dioxide emission per year, as well as those they aim to implement in the future. This background research was then combined with research on “Evergreen Affordability” and “Affordable Green Guidelines,” which are sources that both aid in modeling “green” affordable housing, to propose environmentally friendly changes for affordable housing. This study further aims to show that environmental efforts can have an economic impact as well since they can reduce maintenance costs and the tenants’ rents.

ENV SCI - 13 POWER SECTOR SITUATION IN PAKISTAN

Tanzila M Rahman (UN) & Micha Tomkiewicz, Environmental Study Program, Brooklyn College-CUNY, Brooklyn, NY

Pakistan is an energy deficient country, where a large fraction of the population still does not have access to modern day energy services such as electricity. This is due to very limited fossil fuel resources and poor economy, which constrains the import of fossil fuels on a large scale. In this paper Pakistan’s energy use (per-capita GDP, per-capita primary energy supply, and per-capita electricity generation) is compared to India and China. Pakistan’s rising energy demand and energy supply is presented through statistical analysis. Accordingly, it is researched that how is energy contributing to Pakistan’s economic growth? By comparing the Pakistan’s per capita electricity consumption rate to India and China it is found that electricity consumption results in the country’s economic growth. In addition, by comparing the statistics of India, Pakistan and China it is also proved that increasing per capita electricity consumption has a strong correlation with increasing per capita GDP. The analysis of the projects Pakistani government is taking to bring down the cost and to electrify the villages is presented. As a result of the research it is found that currently government of Pakistan is working on many projects with the help of Asian Development Bank and World Bank. The Overseas Private Investment Corporation (OPIC) and US Trade & Development Agency (TDA) have also been active in Pakistan in the energy sector. As a result of these steps the estimated increases in energy supply needed to sustain different rates of economic growth in Pakistan is also discussed.

ENV SCI – 14 PREDICTING THE MAXIMUM RANGE OF ROSA MULTIFLORA USING SECONDARY DATA ANALYSIS AND GIS

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The goal of this study is to help scientists, land-use planners and others predict the maximum range of *Rosa multiflora* and determine regions where the plant is most and least likely to proliferate based on the soil analysis of *R. multiflora*, commonly known as Multiflora Rose. This species is a dominating invasive plant found in the Tri-State area that has been shown to affect biodiversity, exclude native species for its own growth and decrease vegetation that is essential to inhabiting fauna. Our hypothesis was that areas with a high proportion of favorable soil suborders of *R. multiflora* will show greater likelihood of species invasion.

To determine which soil suborders are favorable, we obtained *R. multiflora* occurrence data from the BBG’s herbarium collection. When GPS data for the locations was not indicated, narrative descriptions were translated to precise coordinate using Google Earth. To retrieve soil suborders associated with the growth of *R. multiflora*, coordinate data was entered in the USDA Web Soil Survey. ArcMaps was then used to spatially analyze and identify potential patterns for the entire Tri-State area. Although we

faced methodological issues using secondary data, our research suggests *R. multiflora*'s maximum range will spread and begin to proliferate most rapidly in geographical areas with the soil suborder Fluvents and least likely in areas of the suborder Udepts. It is hoped that we will be able to continue our pursuit of additional data from other US herbariums and obtain finer-grained soil classification data for the Tri-state area.

ENV SCI – 15 ARSENIC CONTAMINATION OF DRINKING WATER IN BANGLADESH AND THE STATUS OF INTERVENTION STRATEGIES

Tarnima Farhin (UN) & Micha Tomkiewicz, Department of Environmental Studies, Brooklyn College-CUNY, Brooklyn, NY 11210

World Health Organization (WHO) has identified Bangladesh as "the largest mass poisoning of a population in history". The purpose of this paper is to describe the history of arsenic in drinking water, measures that have been taken to alleviate mass poisoning, and propose strategies for intervention. This paper compares between conditions and intervention methods in Bangladesh and West Bengal, and their success rates due to similarities in economic and geochemical conditions. Data presented is a compilation of previous research on the status of arsenic remediation in Bangladesh. Long term exposure to arsenic can cause sores on the chest, palms, cases of skin, lung, liver, bladder and pancreas cancers, and arsenicosis. The World Bank has agreed to provide Bangladesh with \$32.4 million to develop methods in arsenic intervention. The Bangladesh Government and international aid organizations are working together to remedy the situation by providing deep tube wells, dug wells, rain water harvesting, surface water treatment, and treatment of arsenic contaminated water. Even though measures are being taken, it is estimated that one to two thirds of the population is still at the risk of drinking water containing arsenic. Success of remediation and intervention also depends on socioeconomic factors, which can be solved with community education, participation, and monitoring. Arsenic is a naturally occurring element found throughout the earth's crust. The situation and efforts in Bangladesh can be used to aid other developing countries, who are also suffering from health risks associated with arsenic in drinking water.

ENV SCI – 16 AIR POLLUTION AND LUNG FUNCTIONALITY IN EAST FLATBUSH

Chanique Baker (HS), **Benn Vaughn**(HS), **Christina Rosarion**(HS), **Jahliisa Garrett**(HS), **Janisa Mills**(HS), **Dione Benjamin**(HS), Abul Kalam, Suazo John, Jerome Powell, Lindelle George, Carl Azard, Jacob Clifford; ITAVA, Brooklyn NY

Air pollution within a community can be studied in many ways; you can directly measure the air pollution, you can investigate polluters such as trucks, or you can measure the effects of air pollution. In this study we were studying the effects of air pollution on health. The purpose of this experiment was to find out if air pollution is affecting the respiratory rates of people in East Flatbush. Air pollution can cause asthma, Chronic Obstructive Pulmonary Disease and high occurrences of bronchitis. In our study we measured the forced expiratory volume (FEV) and peak expiratory flow (PEF) in high school students attending Tilden High school in Brooklyn New York. Our findings are mixed but suggest that students living in and around Flatbush, Brooklyn may have lower than normal rates on both scales.

ENV SCI – 17 BROOKLYN'S STRIDES TOWARD SUSTAINABLE TRANSPORTATION

Vadim Shteyler (UN), **Susan Chen** (UN), **Charissa Cheung** (UN), **Alexandra Chudner** (UN), & Prof. Micha Tomkiewicz, Department of Environmental Studies, Brooklyn College, Brooklyn, NY

Brooklyn, with 2.5 million people, is the most populated NYC borough and growing. Its population relies very heavily on public transportation, 57.5 %, to commute to work. The other majority, 30.4 %, must drive to work. Sustainability is impossible without a shift to more environmental means of transportation. This translates to more accessible, reliable, and sustainable public transportation networks. PlaNYC 2030 aims to renovate and construct 28 subway stations and a commuter rail station in Brooklyn, make new bike lanes and racks, and use more efficient trains and hybrid buses. The economic stimulus package allocated \$1.3 billion for renovating transportation in NYC. The package plans to fund ten subway stations in Brooklyn. The number of train users has been increasing. However, the number of bus riders has been oscillating, possibly because of a 4%

decrease in service between 2002 and 2006. In order to keep up with PlaNYC's ambition a lot more must be done. After careful analysis of PlaNYC's data and interviews with PlaNYC and MTA officials, certain issues beg attention. Though great progress has been made with new bike lanes, more emphasis must be placed on expanding public transportation. Most funds are being used to renovate existing infrastructure, the efficiency of which is debatable (as in the case of hybrid buses) while expanding lines to underserved areas would surely attract more passengers and increase carrying capacity for the growing population. Funding Bus Rapid Transit lines and building stations within 0.5 mile of every point would attract more passengers.

ENV SCI – 18 SUSTAINABILITY IN STATEN ISLAND

Majid Sahin (UN), **Ali Sahin** (UN), **Adiba Ishak** (UN), **Araceli Trada** (UN), & Dr. Micha Tomkiewicz, Brooklyn College, Brooklyn, NY

Global warming and sustainable growth are critical issues in modern times. The global temperature is increasing from a direct link to developing economies, gradual increase in population, and ultimately more burning of fossil fuels. Sustainable growth is the process in which countries can endure without deteriorating any potential growth or social enhancement. However, the world faces dire costs for solutions to sustainable development and the motivations of developing countries to favor these expenses are small. The U.S. is attempting to lure countries into accepting sustainable development by acting as a role model in which cities around the country will embark on obtaining "green" technology, and the U.S. will also attest the viability of green technology permitting sustainable development. Our research focuses on how energy development in the borough of Staten Island in areas of transportation, housing and energy renewability from Fresh-kills will make the borough more sustainable. Data have been collected from many sources including books, websites and interviews. The stimulus package distribution was studied to uncover future plans for development. Staten Island borough will have the largest population increase by 2030. The borough must create more housing that is affordable and green, such as Markham Gardens that has achieved both, and is amongst the top 10 "greenest" neighborhoods in America. Staten Island has the greenest land in NYC and is also planning a future of sustainable development by renovating its housing sector, improving recent transportation technologies into a more cleaner and efficient infrastructure, and creating energy from buried garbage.

ENV SCI – 19 CONGESTION IN MANHATTAN: SUSTAINABILITY

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Traffic congestion is a major problem in Manhattan. PlaNYC addresses this problem using various alternative transportation methods, including increased cycling, busing, and subway ridership. The population has increased drastically in the last decade, resulting in an increase in energy usage. This trend will only continue to increase through 2030; thus, NYC needs more means of clean transportation. To accommodate these changes, PlaNYC proposes that the city invest in sustainable and clean forms of transportation. Congestion pricing promotes less vehicles on the road and more reliance on public forms of transportation such as buses and subway trains. Hybrid buses, transit network expansion, and cycling are just three plans proposed by PlaNYC. The ultimate goal is to create a sustainable NYC. Many improvements have been discussed since the plan's initial proposal, and PlaNYC's current implementations seem promising, but will these plans be feasible and bring about effective change?

ENV SCI – 20 NUTRIENT LOADING INTO PROSPECT LAKE

Shamsul Huda (HS), Crystal Ally, Kimberly-Ann Brady, Kamaaya Byers, William James, Stayce Kay, Brian Kellogg, Micah Miller, Rehana Nipa, Marlisa Perry, Noel Santos-Perez, Sushanna Scott, Yssis Selby, Claude Theodule, Natalie Veriguette, Yashiya Warren, S.T.A.R. Early College School at Erasmus Hall, 911 Flatbush Avenue, Brooklyn, NY 11226.

Certain sections of the lake in Prospect Park (Brooklyn, New York) are observed to be covered with a dense mat of algae and weeds during the warm weather months, diminishing the park's aesthetic appeal. This annual algal bloom is caused by nutrient loading into the lake. Surface water from the

Prospect Park system was sampled in April of 2009 using commercially available water testing kits. Parameters of water chemistry relating to ecological health were measured. These data were compared to historical data from 1996. The source of the limiting nutrient is identified and the trophic status of Prospect Lake is assessed. Removal of the limiting nutrient, if practicable, is expected to remediate the situation over time.

Supported by NSF Award No. 0638718

ENV SCI – 21 SURVEY OF LEAD IN BROOKLYN RESIDENTIAL TAP WATER

Marlisa Perry (HS), Crystal Ally, Kimberly-Ann Brady, Kamaaya Byers, Sierra Deas, Shamsul Huda, William Jones, Brian Kellogg, Micah Miller, Stayce Kay Muirhead, Rehana Nipa, Ernesto Piggett, Noel Santos-Perez, Sushanna Scott, Yssis Selby, Roberto Stevens, Claude Theodule, Natalie Veriguette, and Yashiya Warren, S.T.A.R. Early College School at Erasmus Hall, 911 Flatbush Avenue, Brooklyn, NY 11226.

Elevated levels of lead in drinking water pose a health hazard to young children, notably by slowing down normal mental development. The action level for lead in New York State is 0.015 milligrams of lead per liter of water. Residences in Brooklyn, New York were sampled to measure concentrations of lead in tap water by inductively coupled plasma mass spectroscopy (ICPMS). No survey site exceeded the New York State Department of Health action level. Slightly elevated levels of lead, where present, are thought to be caused by overnight suspension of lead-containing particles from corroded household plumbing. Filtration and flushing of the tap are evaluated for efficacy in lead removal.

Supported by NSF Award No. 0638718.

PHYSICS – 1 TEM ANALYSIS OF MICROSTRUCTURE OF AlN/SAPPHIRE GROWN BY MOCVD

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AlN and Al-rich AlGaN have emerged as promising deep ultraviolet (UV) materials for the development of deep ultraviolet optoelectronic devices such as light emitting devices and detectors in the spectral range down to 200 nm. High quality AlN/sapphire can be used as templates to grow nitride based ultraviolet and deep ultraviolet photonic devices due to high thermal conductivity and transparency of the light. The performance of the devices significantly depends on the microstructures of the templates. We present here TEM analysis of the microstructure of AlN epilayer grown on sapphire by metal organic chemical vapor deposition. Both plane and cross section views are investigated by a transmission electron microscopy. It has been revealed that the dislocations are greatly reduced by using high temperature buffers. Density of edge dislocations dominates the total density of dislocations. Dislocation density also decreases with increasing thickness due to the annihilations of the dislocations. Implications of our finding for the applications in deep UV optoelectronic devices will be discussed.

This project was supported by PSC-CUNY

PHYSICS - 2 GROWTH OF ZINC OXIDE NANOWIRES BY CHEMICAL VAPOR DEPOSITION

Julius Nasser (UN), and Mim Nakarmi, *Department of Physics, Brooklyn College of the City University of New York, Brooklyn, NY 11210*

Zinc Oxide (ZnO) has emerged as an alternate wide bandgap material for the development of low cost Light Emitting Diodes (LEDs). Due to the large exciton binding energy (~60 meV) at room temperature, higher quantum efficiency is expected in ZnO based LEDs. Semiconductor nanowires have potential applications as one-dimensional structures and building blocks for nano-devices. We present here the growth of ZnO nanowires using Chemical Vapor Deposition (CVD) technique. A homemade CVD machine was used to grow the materials. Gold nano-particles were deposited on silicon substrates by using a spin coater. Mixture of ZnO and graphite powders was used as the precursor. The powders was heated around 950° C. Argon was used as carrier gas to transport the vapor of ZnO to the substrate. The CVD system and growth conditions to synthesize ZnO nanowires were optimized. The samples were characterized by Scanning Electron Microscope (SEM) and other techniques. Various characterization results and their implications will be presented.

We acknowledge the NIH support for the MARC program to conduct this project.

PHYSICS – 3 INVESTIGATION OF DISLOCATIONS IN ALUMINUM NITRIDE EPILAYERS USING ATOMIC FORCE MICROSCOPY

Michael Shannon (UN), Anna Tsatskina, Yara Adam, and Mim Nakarmi, *Department of Physics, Brooklyn College of the City University of New York, Brooklyn, NY 11210*

Atomic force microscopy (AFM) was employed to investigate the threading dislocations in Aluminum Nitride (AlN) epilayers grown on sapphire substrates. Due to its wide band gap, ~6.1 eV, AlN has applications in the development of deep ultraviolet optoelectronic devices such as light emitting devices and detectors in the spectral range down to 200 nm. The presence of high dislocation densities in AlN epilayers grown on sapphire substrates affects the performance of the devices. We present here an investigation of threading dislocations in AlN revealed by the chemical wet etching method. The surface morphology of AlN was first imaged using AFM. To reveal the dislocations, the epilayer was then etched using a KOH solution of 15% by weight at 60°C. AFM images of the etched surfaces show pits with different sizes and densities. Images were taken with various etching times: 5, 10, 15, and 20 minutes. The dislocation densities on the epilayer were determined based on the etched pit densities. The type of threading dislocation present was determined from the size and nature of the etched pits.

ENG – 1 FIN DESIGN FOR OPTIMAL FLIGHT IN MODEL ROCKETS

Charles Sutton (HS), Morris Ishay (HS) and Ezra Dayan(HS), & Mr. Steven Kaye,
Magen David Yeshiva Celia Esses High School, Brooklyn, NY 11214

The question being addressed in our research is which fin design will give us the optimal flight in an Alpha-1 Estes Model Rocket. We are attempting to design fins that will give the rocket the greatest altitude in flight while still remaining stable throughout. The concept of our design is to bend the ends of the fins to give the rocket rotation during flight. This is similar to the rifling of a gun. We also hope that our fin design will give the rocket a stable flight. The immediate goal of our research is to design a rocket with the perfect balance of rotation and stability in flight.

We designed a wind tunnel experiment to test the concept of induced spin in the rocket. We used acardboard tube as our rocket body. We tied a string between two ringstands and mounted the body of the rocket on the string. We designed fins of different shapes and put them in different places on the rocketbody. We turned on a high velocity fan and saw that the body developed rotational spin. The goal of the experiment was to get the rocket to achieve the greatest degree of rotation with minimal vibration. We found that when we placed the fins about two-thirds the length from the nose of the rocket, it best fit our research goal. There were also bends in all the fins to deflect the air. We found that bending the fins uniformly produced spin in the rocket tube.

CHEM – 1 DESIGN AND SYNTHESIS OF A BENZOPOLYSULFANE DRUG-CONJUGATE

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There is an urgent need for novel antibiotic agents with new mechanisms of action due to the growth of multidrug resistant bacteria and tumor cells. We are developing an entirely new class of compounds (polysulfanes) where drug resistance can be evaded due to the lack of exposure of organisms to these compounds. Thus far, the synthesis of a benzopentathiepin “conjugated” to a ceramide has been accomplished. The polysulfane-ceramide conjugate was synthesized in 9 steps and 1.6% overall yield. The final step of the synthesis involved the reaction between 7-carboxybenzopentathiepin *p*-nitrophenyl ester and *D*-erythrosphingosine and the formation of an amide bond. The development of conjugation chemistry of polysulfanes beyond our lead ceramide compound should unveil which conjugate moieties are best suited to polysulfanes to facilitate drug delivery.

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CHEM – 2 A HYBRID PHOTSENSITIZER/FIBER OPTIC DEVICE FOR ON-SITE SINGLET OXYGEN GENERATION

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Optical fibers have been used in remote oxygen sensing, and as light sources in many photodynamic therapy and telecommunications applications. To date, fixing a photosensitizer to the end of a fiber optic device through which O₂ flows has not been described in the literature. We have taken steps toward the construction of such a singlet oxygen fiber optic. Construction began, and we found that a 220-μm diameter commercial hollow core photonic bandgap fiber could be coupled to a Nd:YAG laser with a microscope objective focusing 532-nm light into the optical fiber. The system was designed so the hollow fiber was also coupled to a high-pressure oxygen tank. We exploited the favorable heterogeneous sensitizer properties of *meso*-tetra(*N*-methyl-4-pyridyl)porphine adsorbed onto porous Vycor glass (PVG) (J. Giaimuccio et al. *J. Phys. Chem. B* **2008**, *112*, 15646) and fashioned this glass into a cap. Next, we put the sensitizer-adsorbed cap on the distal end of the hollow optical fiber with the intention of flowing oxygen and initiating the sensitizer excitation through the core of the fiber. Initial studies analyzed the singlet oxygen existing the distal end of the capped fiber, which reacted with (*m*-C₆H₄SO₃Na)₃P in aqueous solution to give the phosphine oxide, (*m*-C₆H₄SO₃Na)₃P=O.

Supported by National Institutes of Health GM076168-01

CHEM – 3 THEORETICAL STUDY OF SINGLET OXYGEN-RELEASE PROCESSES OF ORGANIC PEROXIDES

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Singlet oxygen is a reactive electronically excited state of oxygen of importance in atmospheric, biological, and therapeutic processes, and is used as a reagent in organic synthesis. Using density functional theory, we investigated two organic peroxides, a dioxapropellane and a dioxapaddlane, and found evidence suggesting they generate singlet oxygen upon decomposition. As the compound names imply, dioxapropellane has the shape of a 3-bladed propeller, and dioxapaddlane has the shape of a 4-spoked paddle. The decomposition of dioxapropellane, 7,8,9-trioxatricyclo[4.2.1.0^{2,5}]nona-2(5),3-diene yielded the cyclobuteno[*c*]-annelated furan and singlet oxygen by a retro Diels-Alder-type reaction. The potential energy surface that characterized dioxapaddlane, 1,4-diicosa naphthalene-1,4-endoperoxide, was more difficult to deduce computationally due to its flexible polymethylene “lid”, which seemed to favor semi-circle rotation over the peroxide group, inhibiting the dissociation of singlet oxygen.

Supported by National Institutes of Health GM076168-01

CHEM – 4 SYNTHESIS AND CHARACTERIZATION OF NEW RUTHENIUM(III)-KETOCONAZOLE COMPLEXES AS POTENTIAL ANTI-TUMOR AGENTS BY WAY OF THE STUDY OF THEIR INTERACTION WITH DNA AND EVALUATION OF BIOLOGICAL ACTIVITY THROUGH GROWTH INHIBITION ASSAYS

Dalanda Jalloh (UN), Roberto A. Sanchez-Delgado, PhD Department of Chemistry, CUNY-Brooklyn College, Brooklyn, NY 11210

This project describes the synthesis, characterization and biological evaluation of new ruthenium(III) complexes and explores the potential of ruthenium(III) complexes not only as anti-cancer agents, but also as antimicrobial agents. The field of ruthenium based organometallic chemistry is highly promising and is a major component of metal-based pharmaceuticals. During this study, two new ruthenium(III) complexes containing ketoconazole were successfully synthesized, $\text{Na}[\text{Ru}(\text{KTZ})_2\text{Cl}_4]$ (**1**) and $\text{Na}[\text{Ru}(\text{DMSO})(\text{KTZ})\text{Cl}_4]$ (**2**), which were characterized by FTIR spectroscopy and elemental analysis. Reduction profiles were followed by 1D NMR via in situ experiments. The physico-chemical properties were evaluated using UV-Vis kinetic studies and conductivity measurements to assess the behavior and stability of the compounds in aqueous media. The DNA interaction studies were carried out using UV-Vis spectroscopy via thermal denaturation experiments and circular dichroism. Biological studies were conducted using antimicrobial growth inhibition assays and revealed compound **2** to be a promising antimicrobial agent.

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CHEM – 5 CONFORMATIONAL STABILIZATION OF G-QUADRUPLEX DNA BY METALLOPORPHYRINS

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Formation and stabilization of the human telomeric G-quadruplexed DNA *in vitro* has been found to inhibit the enzyme telomerase, which is overactivated in tumor cells. Quadruplex interacting agents (QIAs), ligands that bind and stabilize the human telomeric G-quadruplex DNA, have been recognized as potential chemotherapeutic agents. Porphyrins are promising QIAs with the additional versatility of central metal-ion chelation. In the present study we have investigated the effects of various metal ions (Co (III), Cr (III), and Mn (II)) bound to the base porphyrin mesoporphyrin IX (MPIX) on the overall selectivity and specificity of binding with the G-quadruplex conformation, using fluorescence, absorbance and circular dichroism spectroscopies. Our data suggests that all three metal-porphyrin derivatives exhibit high binding selectivity for G-quadruplex over double-stranded DNA, and appear to promote a conformational switch from antiparallel to parallel quadruplex conformation. Changes in the metalloporphyrin absorption spectra on binding with the G-quadruplex DNA suggests intercalating, groove binding or external stacking interactions. In addition, melting curve data reveal that all three metalloporphyrin derivatives can stabilize the G-quadruplexed DNA over N-methyl mesoporphyrin IX (NMM), with a central methyl group instead of a metal ion, in the order: NMM < Co(III)MPIX < Mn(II)MPIX < Cr(III)MPIX.

Supported by NIH-SCORE grant.

CHEM – 6 FORMATION AND STABILIZATION OF G-QUADRUPLEX DNA STRUCTURES WITH BENZO[b]FLUORENONE

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Guanine-rich single stranded DNA sequences can adopt four-stranded intramolecular G-quadruplex structures, which are believed to play a key role in tumorigenesis through regulation of several growth related genes and inhibition of telomerase. Given the biological significance of DNA-quadruplex structures, we are interested in studying the effect of so-called quadruplex interactive agents (QIAs), which are able to selectively bind to the DNA-quadruplex and stabilize the folded conformation. Earlier investigations of QIAs suggest that an important characteristic for quadruplex binding is the planarity of the binding species. Here, we report investigations of the effect of benzo[b]fluorenone (BF) on

quadruplex formation and stability, exploiting its rigid planar structure and solvatochromic fluorescence emission properties. Circular dichroism studies indicate BF induces quadruplex formation, promoting the anti-parallel conformation. Thermal unfolding studies further suggest that BF stabilizes quadruplex formation of the human telomeric DNA-quadruplex sequence. Preliminary fluorescence studies of BF associated with DNA-quadruplex show emission wavelength shifts and intensity changes compared to controls. To aid interpretation of this fluorescence data, the spectral responses of BF in various polar and hydrogen-bonding solvents have been measured. These observations suggest that the BF/quadruplex association involves a relatively polar and hydrogen-bonded environment.

This work was supported by NIH SCORE Grant S06 GM 060654.

CHEM – 7 FTIR STUDY AND TWO-DIMENSIONAL CORRELATION ANALYSIS OF THE EFFECTS OF HALOGENATED ALCOHOLS ON THE STRUCTURE OF β -LACTOGLOBULIN

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The paradox of protein folding stems from the apparent lack of inherent folding code but amazingly reproducible folded structure for any one given amino acid sequence. Here we study the beta sheet-to-alpha helix refolding process for the whey protein, beta lactoglobulin (β LG). We employ the technique, Fourier transform infrared spectroscopy (FTIR), because it reports on these secondary structure or folding changes through the Amide I band in the $\sim 1620 - 1680 \text{ cm}^{-1}$ spectral region. Halogenated alcohols such as trifluoroethanol (TFE) are known to induce the beta sheet-to-alpha helix secondary structure transformation. We exploit the volatility of these alcohols and the reported maintenance of solvent-phase secondary structure for protein solid films (Jackson and Mantsch 1992) to avoid the problem of overlaid water vibrational modes in the Amide I region. Secondly, we have collected a set of twenty spectra, varying the water to alcohol concentration in order to map the beta sheet-to-alpha helix refolding process. The concentration of β LG is constant at 10mg/ml while the concentration of TFE is varied from 0M to 10M. The data set of spectra is used to construct a two-dimensional correlation map of the spectral changes accompanying the solvent changes. This mapping exposes correlated changes in spectral peaks and thus provides information on protein structural changes that occur simultaneously. We show that under the conditions used here, TFE is effective in partially converting β LG from a beta sheet to alpha helical structure. Our plan is to affect a full β LG transformation to the alpha helical structure using other halogenated alcohols, and map the unfolding and accompanying gelation process via heating.

Supported by Brooklyn College Start-up funds and PSC-CUNY award # 60087-37 38

CHEM – 8 IN SEARCH OF FOSSIL FUEL ALTERNATIVES: CYANOBACTERIA FOR PHOTOSYNTHETIC ENERGY PRODUCTION

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With the greenhouse CO₂ emission levels rising, we are facing a potential for major temperature increase and climate changes. One of the alternatives to burning fossil fuel is to use oxygenic phototrophs to produce hydrogen gas in concentrations equivalent to those of commercially available solar cells. Some of these organisms use solar energy to split water as part of photosynthesis and then undergo autofermentation to generate ethanol, and a byproduct hydrogen gas. *Arthrospira* (*Spirulina*) *maxima* is a Lake Natron native cyanobacterium with one of the fastest PSII turnover and a PQ pool 3-5x larger compared to algae. It was used to evaluate the effects of osmotic stress on the hydrogen production, hypothesizing that accumulating osmolytes and increasing the rate of their breakdown would lead to greater hydrogen yields. *A. maxima* filaments were adapted to grow in 0-1M additional NaCl Zarrouk medium to synthesize osmolytes and then resuspended in (bi)carbonate buffer and kept in dark fermentative conditions to yield fermentative products, measured via ¹HNMR, and hydrogen, determined using gas chromatography. Though hydrogen yields were not stimulated,

there were significant increases of ethanol, acetate, and formate production as well as a 2.5X increase in sugar concentrations under more osmotically stressed conditions.

Supported by AFOSR and NSF REU

CHEM - 9 FIRE RETARDANT: WHAT YOU SHOULD KNOW?

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Fire is a major hazard to health and property. Every year thousands of people have fires in homes or in any other public places, which causes death or injury¹. A fire could occur at any time regardless of the precautions taken. Therefore, the purpose of this study was to investigate how the effects of a fire can be minimized. If fire cannot be prevented it is important to the public's health that ways be found to reduce its impact².

During this study ways several different types of fabrics were treated in a solution made up of a combination of certain chemicals to see if they could reduce the speed at which these particular materials burn. The research shows that using each of the four chemicals by itself was not effective in reducing burning. However, when all four were combined to make a solution, the materials that were treated in the solution demonstrated a reduced rate of burning. The chemicals used were borax, boric acid, ammonium sulfate, and starch.

The findings of this study would suggest that materials treated to reduce flammability could give one very valuable time for corrective action if they were involved in a fire.

CHEM – 10 INTERACTIONS OF RUTHENIUM COMPLEXES WITH ALBUMIN

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Albumin is the most abundant plasma protein in the body. It is known to have the ability of interacting with different kind of drugs through the histidines in its IIA and IIIA domains, therefore affecting their pharmacologic behavior. That is particularly interesting in the case of metal-containing drugs with medicinal properties. We have, thus, studied the interaction of albumin and five antitumor ruthenium complexes of general formula Arene-Ru-Chloroquine using Circular Dichroism (CD) for the conformational changes, and Isothermal Titration Calorimetry (ITC) for the binding affinities. The CD spectra shows a significant impact on the protein structure with the loss of alpha helical stability of the protein. In addition, the results indicate that those ruthenium compounds with vacancies in their coordination sphere are able to interact with albumin in a higher extent than those with no available positions, suggesting a covalent mode of interaction, probably between the metal ion and the histidines of the binding sites.

CHEM – 11 THE EFFECT OF LEAD ON BONE MINERAL PROPERTIES FROM FEMALE ADULT OSTEOCALCIN-DEPLETED KNOCK-OUT MICE.

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Lead toxicity is a major problem in the U.S. with elevated blood lead levels being highest among very young children and older adults ≥ 50 years old. The molecular mechanism of lead toxicity is not known. Osteocalcin is an abundant protein found in mineralized bone and plays a role in bone remodeling and bone crystal size. It has also been shown to bind lead tightly and increase the amount of mineral bound protein. To investigate the role of osteocalcin in lead toxicity we exposed osteocalcin

depleted knock-out mice to lead and control solutions from 2 to 6 months of age (250 ppm lead, blood lead 25 $\mu\text{g}/\text{dL}$ at sacrifice). Bone mineral properties were examined using Fourier Transform Infrared Microscopy (FTIRM), quantitative microcomputed tomography (microCT) and biomechanical measurements. We have previously shown that lead decreases bone mineral density, bone strength, collagen maturity and bone crystal size in adult wild-type female mice femora bones containing osteocalcin. In contrast, lead increased the bone mineral density, increased the mineral/matrix ratio in the periosteum, had no effect on the bone strength, and increased bone crystal size in the osteocalcin-depleted knock-out mouse femora. Similar to the wild-type femora, lead also decreased collagen maturity. These results suggest that osteocalcin does not play a role in the effect of lead on collagen maturation. However, it is involved in the detrimental effect of lead on bone remodeling, mineral deposition and crystal size leading to decreased bone density and strength.

Supported by NIH grant ES-9032 and NIGMS award number T34GM008078.

CHEM – 12 THE EFFECT OF LEAD ON BONE MINERAL PROPERTIES FROM FEMALE ADULT C57/BL6 MICE.

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Lead toxicity continues to be a major problem in the U.S. with elevated blood lead levels being highest among very young children and older adults ≥ 50 years old. Bone is the major reservoir of body lead and accounts for 75% in children and 90% in adults. We investigated the effect of lead accumulation on the femora from adult, 6 month old female C57/BL6 mice ($n=10/\text{group}$) that were administered lead in the drinking water (250 ppm, blood lead 35 $\mu\text{g}/\text{dL}$ at sacrifice) for 4 months. Bone mineral properties were examined using Fourier Transform Infrared Microscopy (FTIRM), quantitative microcomputed tomography (microCT) and biomechanical measurements. Lead significantly decreased the bone mineral density in the cortical and proximal trabecular bone, and increased the marrow area in the cortical bone with microCT. Whole bone three-point bending showed a trend of decreased maximum and failure moments in the lead treated bones compared to controls. Lead significantly decreased the mineral/matrix ratio, collagen maturity and crystallinity in the trabecular bone as measured by FTIRM. In the cortical bone lead significantly decreased collagen maturity and produced a trend showing an increased carbonate/mineral ratio by FTIRM. In contrast to cell culture studies, lead significantly increased serum osteocalcin levels (71 $\pm$ 3.5 vs. 46 $\pm$ 3.3, $p<.001$) suggesting increased bone turnover. These data show a weakening of cortical bone with lead in adult, female mice and suggest that lead may exacerbate bone loss and osteoporosis in the elderly.

Supported by NIH grant ES-9032 and NIGMS award number T34GM008078.

GEO – 1 EFFECT OF pH AND EDTA ON As SPECIATION IN Fe-RICH WATER

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Solid phase extraction (SPE) columns are often used for aqueous arsenic speciation. The use of SPE columns is evaluated for (1) speciation of arsenic in iron-rich groundwater and (2) speciation of arsenic from sediment leachate. Iron in circum-neutral groundwater occurs as Fe(II), which can precipitate in air as Fe(III) and remove arsenic from solution. EDTA can stabilize Fe(III) without interfering with the column resin. Model calculations and preliminary data show that 1 mM EDTA should be sufficient to complex most Fe(III) in common groundwater samples. Therefore, using an SPE column can provide a good estimate of the arsenic speciation for iron-rich groundwater or sediment.

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INDEX

**The names of main authors are underlined*

A

<u>Abbasi, M. BIO - 14</u>	16
<u>Aculova, C. HNS - 6</u>	21
Adam, Y.	32
Aebisher, D.	34
<u>Afanashev, A. PSY - 7</u>	3
<u>Ahmed, R. PSY - 24</u>	9
Akinkunmi, A.	37
Alempijevic, A.	30
Ally, C.	30, 31
Ananyev, G.	36
<u>Asgarova, F. CHEM - 9</u>	37
<u>Asgarova, Z. CHEM - 9</u>	37
Axen, Kathleen.....	20
Axen, Kenneth.....	20
<u>Azar, A. ENV SCI - 1</u>	24
Azard, C.	29

B

<u>Bahrani, M. PSY - 5</u>	2
<u>Baker, ENV SCI - 16</u>	29
Baranowski, J.	12, 15, 19, 21, 22, 23
Benezra, J.	5
<u>Benezra, J. I. PSY - 8</u>	3
<u>Benjamin, D. ENV SCI - 16</u>	29
Berkovic, S.	26
<u>Bhagwandin, C. BIO - 20</u>	18
<u>Bicic, D. PSY - 22</u>	9
Bittman, R.	34
Bohl, C.	3, 5
<u>Bomide, O. HNS - 5</u>	20
Boskey, A. L.	37, 38
Brady, K.	30, 31
<u>Brewster, T. ENV SCI - 8</u>	26
<u>Brick, A. HNS - 8</u>	21
Brogun, D. Y.	11
Budell, W. C.	37
Byers, K.	30, 31

C

<u>Cai, B. PHYSICS - 1</u>	32
<u>Camacho, F. R. BIO - 5</u>	12
Camilien, B.	14
Campese, V.	2, 7
<u>Campese, V. PSY - 3</u>	2
Caroccia, K.	36
Carrieri, D.	36
<u>Castillo, A. CHEM - 3</u>	34
<u>Cazaubon, S. BIO - 9</u>	14
Chase, K.	28

<u>Chaudhry, S. Z. PSY - 4</u>	2
Chen, S.	29
Cheng, Z.	38
<u>Chery, M. CHEM - 6</u>	35
Cheung, C.	29
<u>Cheung, D. BIO - 4</u>	12
Chudner, A.	29
Clifford, J.	29

D

<u>Darroux, N. L. BIO - 13</u>	15
Davenport, L.	35
Davidson, A.	20
<u>Dayan, E. ENG - 1</u>	33
Deas, S.	31
Delamater, A.	2, 7, 8
<u>Desai, A. ENV SCI - 12</u>	28
<u>Dewan, L. PSY - 23</u>	9
<u>Dhanraj, S. PEES - 1</u>	23
Diangco, M. C.	15
Dismukes, G. C.	36
<u>Dixon, K. BIO - 17</u>	17
<u>Dolce, R. BIO - 10</u>	14
Dowd, T. L.	37, 38
Duggan, M.	26

E

Efros, S.	36
<u>Efros, V. CHEM - 7</u>	36
Eshel, D.	18
<u>Esses, L. ENV SCI - 5</u>	25

F

<u>Farhin, T. ENV SCI - 15</u>	29
Fein, M.	7
Fisher, F.	9, 10, 22
Fung, R. G.	12

G

<u>Ganopolsky, E. HNS - 8</u>	21
<u>Garrett, J. ENV SCI - 16</u>	29
George, L.	29
Glassman, A.	20
<u>Glassman, A. HNS - 4</u>	20
Gong, Y.	34
Gonzalez, M.	13, 15, 18
<u>Gotesman, M. BIO - 1</u>	11
Grasso, F.	3, 4, 5, 6, 7

Greer, A.	34
Griesinger, M.	20
<u>Grinshtein, M. GEO - 1</u>	38
Gross, R.	24
Gruillon, D.	18
Gundberg, C. M.	37, 38

H

<u>Hadiisolomou, S. P. PSY - 9</u>	4
Hardin, C. D.	8
Harvey, B.	16, 21, 37
Hasbini, S.	30
<u>Hatab, T. ENV SCI - 9</u>	26
He, Y.	38
<u>Heath, J. B. HNS - 10</u>	22
<u>Ho, M. PSY - 10</u>	4
Huda, H.	31
<u>Huda, S. ENV SCI - 20</u>	30

I

Isaacson, P.	16, 17, 19
Ishak, A.	30
<u>Ishay - M. ENG - 1</u>	33
<u>Iskhakov, S. BIO - 16</u>	16
Issacson, P.	11

J

<u>Jalloh, D. CHEM - 4</u>	35
<u>Jamal, K. PSY - 25</u>	10
James, W.	30
<u>Jean, E. PSY - 11</u>	5
<u>Jean-Pierre, J. HNS - 12</u>	23
John, S.	29
Johnson, A.	1, 2, 8
<u>Johnson, A. PSY - 21</u>	8
Jones, W.	31
<u>Jumalon, J. HNS - 7</u>	21
Juszczak, L. J.	36

K

Kalam, A.	29
<u>Kalita, A. M. BIO - 11</u>	15
<u>Kalita, A. M. HNS - 3</u>	19
Kay, S.	30
Kaye, S.	24, 25, 26, 33
Kellogg, B.	30, 31
<u>Kidwai, I. BIO - 12</u>	15
<u>Kloskowski, K. PSY - 12</u>	5
Kopkalli, Y.	35
Koslowski, K.	6
<u>Kostopoulou, C. ENV SCI - 4</u>	25

L

<u>Leger, E. BIO - 7</u>	13
<u>Lemaire, K. PSY - 18</u>	7
Lewandowski, T.	21
Lin, J.	30
Lipke, P. N.	13, 15, 18
<u>Liu, X. CHEM - 5</u>	35
<u>Lyubimova, A. PSY - 26</u>	10

M

<u>Mahendran, A. CHEM - 1</u>	34
Malakhov, N.	8
<u>Malevic, A. PSY - 13</u>	5
<u>Marecheau, D. BIO - 15</u>	16
Margolskee, R. F.	1
Martinez, A.	37
Medina, J.	15, 18
<u>Medina, J. BIO - 21</u>	18
<u>Mercedes, M. Bio - 22</u>	18
Miller, M.	30, 31
<u>Mills, J. ENV SCI - 16</u>	29
Mimberg, K.	20
<u>Momot, D. CHEM - 8</u>	36
Monir, A. U.	37
<u>Monir, A. U. CHEM - 12</u>	38
<u>Moore, M. PSY - 2</u>	1
Muirhead, S. K.	31
<u>Mukta, S. ENV SCI - 3</u>	24
Müller, R.	6
Muth, T.	17

N

<u>Nadeem, Z. BIO - 2</u>	11
Nakarmi, M.	32
<u>Nasser, J. PHYSICS - 2</u>	32
<u>Nazario, A. ENV SCI - 10</u>	27
Nipa, R.	30, 31
Nishiura, J.	18

O

<u>Olufawo, Y. HNS - 5</u>	20
----------------------------------	----

P

<u>Pacheco, L. BIO - 9</u>	14
Pasternak, Z.	5
<u>Patel, J. HNS - 11</u>	22
Perrin, G. E.	3
<u>Perrin, G. E. PSY - 14</u>	6
Perry, M.	30
<u>Perry, M. ENV SCI - 21</u>	31

Petersen, C.....	5
Petersen, C. L. PSY - 15	6
Phung, K. BIO - 19	17
Pichotto, E. ENV SCI - 2	24
Pierre, S.	17
Piggett, E.	31
Polle, J. E. W.....	11, 13, 14
Powell, J.....	29
Pyronneau, A.....	13

R

Rahman, T. M. ENV SCI - 13	28
Rahmani, K. ENV SCI - 11	27
Ramsook, C. B.	12
Raufova, N. BIO - 3	11
Riad, M. PSY - 2	1
Roddy, J.....	20
Rojkov, D. BIO - 16	16
Ron, I.	1, 8
Rosarion, C. ENV SCI - 16	29
Ryvlin, I.	30

S

Saadia, M. ENV SCI - 5	25
Sahin, A.....	30
Sahin, M. ENV SCI - 18	30
Sanadze, N. HNS - 6	21
Sanchez-Delgado, R. A.	35, 37
Santos-Perez, N.....	30, 31
Saxena, A.	14
Scarlet, J. PSY - 19	7
Sclafani, A.....	1, 2, 7
Scott, S.....	30, 31
Selby, Y.....	31
Senatus, L. M. BIO - 17	17
Shaik, H.....	16
Shand, T. T. CHEM - 10	37
Shannon, M. PHYSICS - 3	32
Shteyler, V. ENV SCI - 17	29
Siddique, U. PSY - 4	2
Singh, S.....	16
Sirotnikov, A. ENV SCI - 6	26
Sitt, E. ENV SCI - 5	25
Soybelman, G. BIO - 6	12
Srour, M. ENV SCI - 1	24
Stephen, T. S.	15
Stevens, R.	31
Sutton, C. ENG - 1	33

T

Tamang, S.....	28
Tariq, S.	28
Tauqeer, Z.....	28
Theodule, C.....	31
Thompson, T. CHEM - 11	37
Tomkiewicz, M.	25, 27, 28, 29, 30
Tomlinson, L. PSY - 20	8
Torofder, S. ENV SCI - 7	26
Trada, A.	30
Tsatskina, A.	32
Tse, J. HNS - 1	19
Tse, L. PSY - 16	6

V

van der Meulen, M. C.	37, 38
van Geen, A.	38
Vaughn, B. ENV SCI - 16	29
Veriguette, N.	31
Volz, S. G. PSY - 17	7

W

Walayat, I. HNS - 2	19
Warren, P. ENV SCI - 14	28
Warren, Y.	31
Wazed, B. ENV SCI - 19	30
Weingort, A. ENV SCI - 2	24
Wiech, E.	14
Williams, B. W.....	35
Wong, K.	18
Wong, K. A. BIO - 8	13
Wu, H. BIO - 18	17

Y

Yagerman, S. E.	37, 38
Yam, A. HNS - 9	22
Young, B. PSY - 6	3

Z

Zamadar, M. CHEM - 2	34
Zheng, Y.	38
Zukerman, S. PSY - 1	1

LEGEND:

BIO – Biology

CHEM – Chemistry

ENG – Engineering

ENV SCI – Environmental Sciences

GEO - Geology

HNS – Health and Nutrition Science

PEES – Physical Education and Exercise Sciences

PSY – Psychology