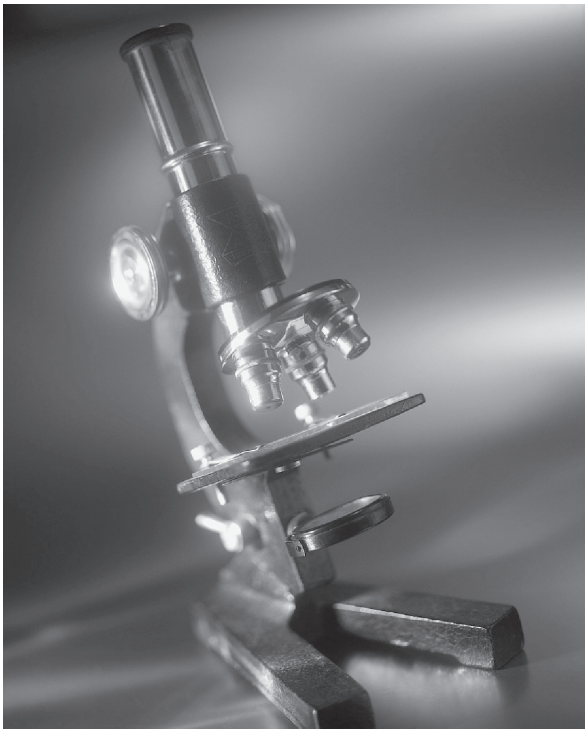
Brooklyn College

Science Research Day

Abstract Book



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May 12, 2006

16TH ANNUAL BROOKLYN COLLEGE SCIENCE DAY

PROGRAM

9:30 A. M.	POSTER SETUP
10:00—12:00	STUDENT PRESENTATIONS AND JUDGING
12:15 P.M.	REFRESHMENTS IN THE GOLD ROOM
12:30 PM	WELCOME AND REMARKS

PRESENTATION OF AWARDS
High School Division
Undergraduate Division
Graduate Division

ALL ARE INVITED TO LUNCH IN THE GOLD ROOM

PRESENTER KEY

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

ANTH - 1 DISCOVERING INSTANCES OF BONE TRAUMA IN ROMAN SIRMIUM: DETERMINING THE FREQUENCY OF TRAUMATIC INJURIES WITHIN A GIVEN SAMPLE OF SIRMIUM RESIDENTS.

Afiya L. Augustine (UN), **Evan A. Brathwaite Jr.** (GRAD), Matthew Brown, Dr. Sophia Perdikaris, Department of Anthropology, Brooklyn College and Hunter College of City University of New York.

Bone trauma is classified as any injury, wound or disruption to bone caused by extrinsic forces, such as warfare, accident, or surgery. Bone fracture is one of the most common osteological signs of traumatic injury in an individual. The objective of this study is to identify and analyze evidence of bone trauma present in the skeletal remains of Roman individuals excavated at Sirmium (Sremska Mitrovica) dated to the $_{1}$St-$_{6}$th Centuries A.D., a former Imperial Roman city situated in modern day Serbia.

Using macroscopic visual analysis of skeletal remains supported by paleopathological techniques and literary sources, we have evidence that reveals the frequency of traumatic injuries present in the aforementioned population. The preponderance of our evidence is derived from an examination of various bone samples of Sirmium residents excavated from one of the six major cemeteries on the boundary of the ancient city. With the recorded documentation, we seek to acquire the frequencies that relate to the different types of bone trauma, then theorize whether there is a correlation between bone trauma in the study sample and occupational stress, age, or other pathological factors.

ANTH – 2 RESPONSES TO PERIODICAL CLIMATIC FLUCTUATIONS IN SUBSISTENCE STRATEGIES of EARLY MEDIEVAL ICELANDERS

Norie Manigault (UN), Mike Sternfeld, Erin Williams, Eduardo Martinez, Nehazia Shah, Konrad Smiarowski, Ramona Harrison, & Dr. Sophia Perdikaris, Dr. Tom McGovern, Department of Anthropology and Archaeology, Brooklyn College and Hunter College of City University of New York.

The main focus of this poster is a comparative analysis of three archaeological sites, Hrísheimar, Sveigakot, and Hofstaðir, situated in the Mývatn region of NE Iceland. A multidisciplinary approach provides the most complete possible interpretation of human subsistence in Viking Age Iceland. A timeline is established through C-14 dating and Tephrochronology; medieval climate is reconstructed using Greenlandic glacial cores and the subsistence strategy is determined through analysis of archaeofauna. The analyzed data shows that three contemporary sites situated within fairly similar environmental, cultural, and economic settings produce different patterns in the archaeological record, and their comparison using various environmental and archaeological techniques presents a very consistent picture of human decision making in this marginal environment.

ANTH – 3 THE ARCHAEOFAUNA OF SKRIÐUKLAUSTUR, A LATE MEDIEVAL MONASTERY IN EAST ICELAND

Albína Hulda Pálsdóttir (GRAD), Department of Anthropology/Archaeology, The Graduate Center, CUNY

The Skriðuklaustur monastery in East-Iceland is in many ways unique. It was founded ca. 1493, much later than other Icelandic monasteries and closed down due to the reformation in 1554. The excavation and analysis of the archaeofauna from Skriðuklaustur are starting to shed light on daily life in the monastery and its function as an institution in Icelandic medieval society.
Despite the fact that Skriðuklaustur is located far inland, a variety of marine species such as cod, haddock and guillemot are present in the archaeofauna. This could be connected to the monastery's role as a landowner. Historical records show that Skriðuklaustur had extensive holdings by the sea side. The presence of fish could moreover be linked to the strict diet and rules of fasting followed by the monks.
The presence of a harp seal (*Pagophilus groenlandicus*) jaw in the collection might be an indicator of drift ice, connected to the cold climatic conditions of the Little Ice Age. Harp seal is not native to Iceland but comes with drift ice from Greenland in cold winters.
The butchery pattern at Skriðuklaustur appears to be different from that typically seen on an Icelandic site. In addition to the usual bi-perforated caprine metapodials, a number of mono-perforated elements were found. This marrow extraction technique has not been observed before in an Icelandic archaeofauna. The ratio of dog chewed bones recovered from the site is also unusually high for Iceland and so is the number of dog elements.

PSY – 1 LEARNING AND MEMORY IN A NOVEL OBJECT RECOGNITION TASK AND THE SPATIAL NAVIGATION TASK IN RATS

Sonia Afroz (HS) & Janice Baronowski, Brooklyn Technical High School, Brooklyn, NY

To determine the relationship between working and reference memory, and learning, rats were tested in consecutively run trials of the spatial navigation task and a novel object recognition task. The object recognition task was modified to include testable variables like pause criterion, target size and target location to get a more accurate understanding of object memory and learning. The object recognition task was used to determine whether rats were using memory and visual clues, or odor clues by using replicas in the identification part of the task. One rat exclusively used odor clues while the others used them to a lesser extent. All rats were able to recover from changing conditions and were able to accurately perform in the consecutively run tasks. These results verify the accurateness of the novel object recognition task and deem consecutive task training acceptable for duplication.

PSY – 2 DEN CHOICE IN *OCTOPUS BIMACULOIDES*

Faiza Arshad (UN) & Frank W. Grasso, Department of Psychology, Brooklyn College-CUNY, Brooklyn NY 11210

Evolutionarily evidence demonstrates that octopuses are the first Mollusca that lost their hard parts completely. A consequence of this change is that they became more

vulnerable to attacks by predators. Cephalopod biologists suggest that in order to avoid predation they develop shelter-using and home-constructing strategies. Shelter choice in some animals and human can involve complex cognitive decision-making and judgment processes. Octopuses not only choose a suitable shelter, but also modify non-secure shelters to increase their security (e.g. field studies by Mather 1994). In this experiment we asked what are the cognitive choices that octopuses make, while choosing a shelter. We built three different shelters having 2, 3 and 4-inch diameter entrance. The experiment was designed to have two parts. In the first part we wanted to observe the shelter choice of the animal. In the second part we wanted to pick the least preferred shelter from the first phase and observed how octopuses modify the entrance space with the given material, due to some unfortunate mishaps we were not able to complete the second phase. The entrance with the smallest diameter would provide the most covering. My results show that shelter usage was not frequent among these octopuses, but whenever shelters were used octopuses show preference for the smallest diameter entrance ()e (2) = **18** P <<0.01). We conclude that an octopus chooses the entrance with the smallest diameter, because it provides safety from predators. Our results confirm Mather's finding that octopuses prefer the den with the smallest entrance.

PSY – 3 EVIDENCE FOR ENTRAINMENT OF AN INVASIVE MONK PARAKEET POPULATION TO HUMAN ACTIVITY PATTERNS.

Corentin L. Bohl[1] (GRAD) & Frank W. Grasso[1,2] [1]The Graduate Center, CUNY, [2]Department of Psychology, Brooklyn College

The Monk Parakeet (*Myiopsitta monachus*) is a gregarious species indigenous to Argentina that constructs elaborate multi-chambered nests housing several pairs of birds. Introduced to Europe and North America, it has been establishing stable colonies and expanding its range for the last 40 years. Its success has raised concerns about its potential as an agricultural pest and its impact on the local ecology. Invasive species must cope with ecological factors that are not part of their natural history. Human activity patterns are pervasive environmental features in dense urban environments. Between February 2003 and April 2006 we studied nest use patterns in a colony in Brooklyn, New York. We used a pseudo-random sampling method to systematically record arrivals and departures of parakeets from the 26 nests in this colony during all daylight hours. Preliminary analysis of these observations led us to hypothesize that the activity of parakeet flocks was entrained to human activity patterns. We analyzed patterns of nest-use with respect to season and time of day. We found, significant seasonal and daily variation in nest use as well as small, significant correlations between time of day and activity. Interestingly, the correlations between time reckoned, as hours after sunrise were consistently lower than those reckoned with respect to the human clock. We conclude that entrainment to human activity patterns contributes to the adaptation of this gregarious species to the urban environment. This evidence for entrainment, if confirmed by further investigation, might suggest means to manage this and other gregarious invasive species.

PSY 4 - THE ROLE OF GABA IN RENEWAL, SPONTANEOUS RECOVERY AND LATENT INHITIBITION

Vinn D. Campese[1] (GRAD), R. Frederich Westbrook[2] & Andrew R. Delamater
Brooklyn College CUNY, [2] University of New South Wales

Three experiments in rats investigated the role of GABA in the contextual control of Pavlovian conditioned magazine approach. Experiment 1 used an ABA vs. ABB renewal design, and showed that systemic injections of the GABA inverse agonist FG 7142 eliminated the renewal effect by selectively lowering ABA CRs dose dependently. However, FG 7142 was further shown to disrupt spontaneous recovery (Experiment 3) while having no effect on the context-specific expression of latent inhibition (Experiment 2). These results imply that renewal and spontaneous recovery are fundamentally different from latent inhibition in that the former are GABA mediated whereas the latter is not.

PSY – 5 EMOTIONAL INTELLIGENCE, COGNITIVE INTELLGENCE AND SOCIAL FUNCTIONING IN HIGH SCHOOL STUDENTS

Denis Dankin (HS), Steven Kaye & M. Martinez-Pons, Madison High School, Department of Psychology, Brooklyn College, Brooklyn, NY

150 high school students ranging in age between fifteen and eighteen years were surveyed to assess their emotional intelligence (EI), cognitive intelligence (IQ), and social functioning. In addition, their parents were surveyed to assess the degree to which they promote the students¡¦ academic and emotional self-regulation. Path analysis revealed important effects among parental influences, students' emotional intelligence and psychological and academic self-regulatory behavior.

PSY – 6 VOLUNTEER EMERGENCY MEDICAL TECHNICIANS AND JOB SATISFACTION

Eddie Esses (HS), Stuart Benas & Steven Kaye, Magen David Yeshiva High School

Volunteer Emergency Medical Technicians (EMTs) were tested regarding levels of job satisfaction, stress, altruism, and commitment to a volunteer role. In addition to these variables, age, years of experience as an EMT, and individual average emergency response rate were taken into account. Thirty-five volunteer EMTs completed a self-administered questionnaire (many of whom filled it out through E-mail) that tested the aforementioned variables. Results indicate that a high average emergency response rate is correlated profoundly with high levels of stress. Other hypotheses comparing the mentioned variables were not supported. The findings of this study can provide insight into how to assist volunteer EMTs that have trouble coping with stress or have low levels of job satisfaction

PSY – 7 SUCKER PREFERENCE IN THE GRASPING BEHAVIOR OF OCTOPUSES

Huma Jahangir (UN) & Frank W. Grasso, Department of Psychology, Brooklyn College-CUNY. Brooklyn, NY 11210

Octopuses manipulate their environment using a very different system of appendages than mammals, relying primarily on their arm-suckers for holding on to or grasping objects where mammals use opposable appendages. We hypothesized that in order to manipulate heavy objects, the octopus uses the suckers, located at the base of its arm which are stronger. Crab prey was placed under a transparent dome in the octopus's tank, and the dome was held in place by strong magnets. Octopus dome- lifting behavior was observed, scoring the position of the suckers used. The results showed contrary to

our hypothesis that the animal prefers to use its mid-arm suckers. One explanation for these results could be that the use of mid-arm suckers is a compromise between base arm suckers, which are stronger but harder to manipulate, and tip-arm suckers, which are highly manipulative but weak.

PSY – 8 EFFECT OF WEATHER PATTERNS ON NEST USE ACTIVITY IN NATIVEZED MONK PARAKEETS POPULATIONS OF BROOKLYN NEW YORK

Lakeisha C. Lubin (UN) & Frank W. Grasso, Department of Psychology, Brooklyn College, Brooklyn, NY

Monk Parakeets (*Myiopsitta monachus*) are gregarious animals that live and forage in large dynamic social groups. They are native to South America (Argentina) and migrated to a number of places in the United States including Brooklyn. These parakeets adapted to a new environment and maintain communal nests arranged in spatial groupings referred to as colonies. Over the last three years (January 2003 to April 2006) we systematically observed nest use in 18 nests in a colony on and in the vicinity of the Brooklyn College Campus. The data we analyzed for this presentation consist of their arrivals and departures for duration of 3 sampled minutes during daylight hours at all times of one year. A pseudo random sampling method was used to select the time of each sample. We also record the weather, describing the sky condition (clear, partly cloudy, cloudy or precipitation) and the temperature (°F) at the time of each sample. These data allow us to look for patterns in the behavior of the monk parakeets that depends on the weather. We hypothesize that the condition of the weather will have an effect on the activity patterns of the Parakeets. Our observations show that there is significantly more nest use activity under some weather conditions than others. Counter-intuitively our analyses provide evidence that the parakeets are more active when it is partly cloudy then when it is clear or cloudy. This result is counter-intuitive we expected the parakeets to be more active under clear weather conditions. Our result raises new questions about the parakeets' behavior. We speculate about genetic, metabolic and decision-making mechanism that might relate weather conditions to nest use activity.

PSY – 9 THE RELATIONSHIP BETWEEN TESTOSTERONE AND AGGRESSIVE BEHAVIOR IN RESEARCH VOLUNTEERS

Opal A. Lynch (HS) & Mitchell E. Berman, Brooklyn Technical High School Brooklyn, NY

To test the hypothesis that traits of aggression correlate positively with testosterone levels in males and females, 36 individuals (19 males, and 17 females) were assessed using a The Life History of Aggression's (LHA) Clinician interview. Serum testosterone levels were taken from the subjects and assessed to determine the average amounts of free and total testosterone in the individuals systems. The testosterone levels and aggression assessments were then compared to determine if there were in fact a correlation between the two. It was shown that Free Testosterone and for the most part Total Testosterone, was significantly correlated to aggression ($r = .44$, $p = .03$ and $r = .37$, $p = .05$), while they had no correlation to criminal acts in the men ($r = .20$, $p = .211$ and $r = .12$, $p = .32$). For the women, Free and Total Testosterone had no significant correlation to aggression ($r = -.05$, $p = .42$ and $r = .03$, $p = .46$), as well as no significant correlation to criminal acts ($r = -.275$, $p = .14$ and $r = .36$, $p = .08$). If the possible correlation between testosterone and aggression is adequately explored, aggression

may be treated and many results of aggression in people may be avoided, allowing for a safer living environment and more effective rehabilitation.

PSY – 10 ENTRAINMENT OF WILD PARROT CIRCADIAN RHYTHMS TO HUMAN ACTIVITY?

Sofronis G. Sofroniou (Grad) & Frank, W. Grasso, PhD &, Biomimetic and Cognitive Robotics Lab, Psychology Department, Brooklyn College-CUNY, Brooklyn, NY11210.

Many animals follow circadian rhythms that are cued by environmental signals. In some living situations though, the behavior patterns of an animal can be entrained to social cues as well as solar ones. Previous research on, the wild Monk Parakeets colony at Brooklyn College, suggested that human activity might entrained the daily behavior patterns of these animals.
In this study we explicitly investigated the hypothesis that the activity patterns of the parrots living around Brooklyn College are entrained to human activity patterns in the vicinity.
To test the above hypothesis, one parrot nest containing about thirty parrots was filmed for five days before and five days after the humans' daylight savings clock adjustment (April 2nd 2006). The filming lasted from sunrise to sunset every day. The parrots' activity (departures and arrivals from and to the nest) was recorded during all daylight hours. These data were used to construct activity time-series at one-third hour resolution for nest use activity. Cross correlation of these time series provide results revealing changes in parrots' activity, related to daylight savings time shift. If this observation verified by further investigation, it could have strong implication on the adaptability of such species to urban environments.

PSY – 11 CLAM-SHUCKING LEG PREFERENCE IN SLIPPER LOBSTERS

Mahrukh Yousaf (UN) & Frank W. Grasso$_1$ Department of Psychology, Brooklyn College-CUNY, Brooklyn NY

Slipper Lobsters *(Scyllarus aquioctinalis* and *Scyllarus notifier)* are obligatory bivalve eaters, and open bivalves such as clams using their ten walking legs. Previous research studies (Lau, 1987) suggested that the third pair of legs performs a specialized function. We hypothesized that Slipper Lobsters without their third pair of legs would be able to switch to using other legs for this function. To test this hypothesis, we restrained the third pair of legs of Slipper Lobsters and observed their clam shucking behavior as compared to an unrestrained control condition. We have done 88 trials on six different slipper lobsters. Our results show that all the restrained lobsters that found the clam were able to complete the shucking using their first, second, and fourth pair of legs. Leg preference in the clam shucking behavior of Slipper Lobsters is more flexible than previously thought. The flexibility of leg use is very important during shucking behavior especially if the third pair of leg is unusable, e.g. after a predator attack.

PSY – 12 PATTERNS IN NEST ACTIVITY GROUP SIZE AND INTERSPECIFIC RELATIONS BY MONK PARAKEETS

Saintedym Wills (HS), Alan Stack & Dr. Frank Grasso, Department of Psychology, Brooklyn College, Midwood High School, Brooklyn NY

Since their arrival in New York City in 1968(Pruett 2000), monk parakeets (Myiopsitta monachus) have captured the interest of researchers hoping to better understand the social behavior of the species. A major agricultural pest in Argentina, the monk parakeet is seen as a potential threat to agriculture in North America (Gochfeld 1973). Unique to the family of Psittacidae, these parakeets build large communal colonies. In the present study I sought to examine the range of social behavior and interspecies interactions at the nests of a community of feral monk parakeets. Patterns of nest building, group size and interspecies relations were observed, recorded and analyzed. Parakeets exhibited daily nest building, often with more than one individual adding sticks to already bulky nests year-round. Parakeets are observed carrying sticks up to twice body their length. The sociality of the birds is seen in the delays between the arrivals and departures of consecutive birds. They tend to arrive and depart from the nest in groups. Interaction between the monk parakeet and other species were also examined. Incidents of other species of birds landing on the nest were recorded. In the observed examples of other species of birds landing on the nest, only once did the parakeets demonstrate aggressive behavior. It is likely that the parakeets expend energy in aggression only when they feel that the nest is threatened. The nest, because it is not always actively defended, may be a point of social organization and a place for housing the parakeets.

PSY 13 - AN EXAMINATION OF TASK STRUCTURE ON CATEGORY LEARNING AND ITS REVERSAL

Janina Scarlet (GRAD) & Andy Delamater, Department of Psychology, Brooklyn College-CUNY, Brooklyn, NY 11210

In this experiment category learning was studied in normal human subjects. Participants initially learned to categorize a set of 16 stimuli into two separate categories. Then, the specific category assignments were reversed either by exchanging all the exemplars in each category together (Total Reversal), or by exchanging only half of the stimuli in each category with one another (Partial Reversal). In addition, task structure was manipulated in this experiment. In one condition the individual stimuli consisted of two sets of features only one of which was diagnostic of category membership (Nonconjoint problem), while in a second condition, both sets of features together were diagnostic of category membership (Conjoint problem). During the reversal phase, accuracy rates were higher and reaction times were lower with Total Reversals than with Partial Reversals in the Nonconjoint problem, and preliminary data suggest this to be true for the Conjoint problem as well. Similar patterns of results in these two problem types suggest comparable underlying learning processes.

PSY – 14 ARE CHILDREN BETTER MOTIVATED WITH REWARD OR PUNISHMENT?

Kathleen Inoa (HS) & Frances Fisher, Franklin D. Roosevelt High School, Brooklyn, NY

Children from the age of three to five tend to misbehave. If you give them a task to do will they do it quicker knowing there's a punishment if he/she doesn't do it or if there's a reward at stake? The children will be given two tasks. One task will be with a punishment and the other with a reward. The researcher hypothesized that if the effect of rewards is increased then the children will listen better and completes the task faster.

The methods being used are punishment and reward. The task that will be given is to clean up a messy room. The researcher must tell the child what to do. Then explain to the child that he will get five minutes in the corner if he doesn't. Record how quickly the child is finished cleaning the room up. Repeat this with all five children. Then repeat this but this time the researcher will tell them they will get a new toy if they clean up. Record the time it took them to finish the task this time. The researcher will analyze which one was done quicker. They will also notice the difference between the two timings.

In the data it is seen that the reward works better on children. Rewards motivate children better then punishments. Sometimes people must use punishments as well because children also have to have discipline. Even though that is true rewards are good things to keep your child enthusiastic.

PSY – 15 THE EFFECTS OF SLEEP DEPRIVATION

Rasha Nusrat (HS) & Francis Fisher, Franklin D. Roosevelt High School, Brooklyn, NY

This project is about sleep deprivation. The initial idea is to time 4 people, two of whom will not be able to sleep. They will be taking a memory test and a speed test. The things needed for this experiment are 4 people, timer, clock, puzzle, cards with pictures and charts. The purpose is to see how not sleeping for 50 hours effects a person's speed and memory abilities. This experiment will have two groups, one will have to stay up for 50 hours. Give both groups the two tests before starting the experiment. Then after every ten hours give them the test again. When 50 hours are over have them take the two tests for the last time.

The result of each group was different from each other. In the beginning child #1 (had sleep) took 40 seconds for the speed test and 50 seconds for the memory test. After the 50 hours passed child #1 took 47 seconds for the speed test and 1 minute for the memory test. Comparing both times, the adult and child only increased by around 10 seconds. Child #2 (no sleep) started with 46 seconds for speed and 55 seconds for memory. Comparing both times, the adult and child only increased by around 1 minute.

The hypothesis was proven correct. People with less sleep would not finish tests very quickly. Their body was very unbalanced. They did not get the fast they did to maintain homeostasis.

SOC – 1 CULTIVATING SOCIAL CAPITAL ON URBAN PLOTS: COMMUNITY GARDENS IN NEW YORK CITY

Dmitri Chitov (UN) & Prof. Sharon Zukin, Department of Sociology, Brooklyn College-CUNY, Brooklyn, NY

This study is based on ethnographic interviews and participant observation of eighteen community gardens in three neighborhoods of New York City: the Lower East Side of Manhattan and East New York and Park Slope in Brooklyn. The research discusses four types of community gardens (agricultural, ethnic, "parks", and multi-purpose) and analyzes the way gardens' organization is affected by the neighborhood. These four types of gardens are distinguished by use of space, organizational structure, and cultural program. The study finds that both "bridging"

and "bonding" social capital are necessary for successful community gardens. I argue that for gardens that are not comprised of family members and people with "strong ties" (i.e. members of extended families residing in one building), the development of social capital depends on two variables: sweat equity (in the form of labor on the land) and resources (especially financial capital – whether by grants, donations, or subsidies). The findings of the study show that lack of available resources causes underdevelopment of "bridging" social capital in agricultural and ethnic gardens from low-income neighborhoods, thus creating difficult conditions for maintaining the gardens. Conversely, community "parks" located in middle-income neighborhoods, usually generate very little "bonding" social capital, which weakens their organizational structure. Long-established multi-purpose gardens with complex forms of democratic government exhibit high levels of both "bridging" and "bonding" social capital, thus making them exemplars in the community garden movement. These differences in social capital, considered in the socio-economic context of the neighborhoods, allow us to envision the possible future of the gardens and to propose necessary steps to ensure their longevity.

SCAS – 1 DOES LONG-TERM MEMORY SUPPORT WORKING MEMORY PERFORMANCE IN SCHOOL-AGE CHILDREN?

Sabina Ajani (UN), **Lyudmyla Kelmenson** (UN) , & Dr. Klara Marton, Department of Speech, Brooklyn College-CUNY, Brooklyn, NY

The purpose of this study was to examine the interaction between working memory and the long-term lexicon during language processing in children with and without language impairment. Three working memory tasks – variations of nonword repetition, traditional listening span and active listening span tasks – were administered to test the following hypotheses:

- All children use their long-term knowledge to support their working memory performance;
  Children with language impairment show lower working memory performance than their typically developing peers;
- The groups not only differ in the number of errors, but also in the type of errors they produce.

The results show that the interaction between the two memory systems – long term & working memory – is not always automatic and effective. Unlike the typically developing children, children with language impairment were not able to take advantage of their long-term knowledge to support their working memory performance. In addition to quantitative group differences, the error analysis data suggest qualitative differences between the children with language impairment and their typically developing peers (e.g., children with language impairment exhibit a large number of interference errors; show weak access to their long-term knowledge, etc.). In overall, the results show that children with language impairment have a deficit in simultaneous processing, which weakness influences the interaction between the long-term lexicon and working memory.

SCAS – 2 SPEECH BREATHING AND VOCAL FOLD FUNCTION BEFORE AND AFTER VOICE THERAPY

Zena and Maria Hinkson (UN) & Professor Schaeffer, Department of Speech, Brooklyn College-CUNY, Brooklyn, NY 11210

The goal of this study is to address vocal fold function in correlation with speech breathing before and after therapy. Fifteen participants with hyperfunctional voice

disorders have been tested before and after therapy on the following variables as they read a 60 syllable sentence: (1) magnitude of inspiratory and expiratory lung volume; (2) lung volume levels at which speech is initiated and terminated, the latter in relation to Resting Expiratory Level; (3) laryngeal function which includes contact and speed quotient, airflow rate as well as estimate of subglottal pressure. These variables have been measured on the following instruments: the Respigraph which test lung volume during speech breathing; the electroglottalgraph which test contact and speed quotient (laryngeal function); the pneumotactograph which measures airflow rate (laryngeal function); a manometer which measures estimate of subglottal pressure (laryngeal function). The values of the participants, as well as additional participants, must be entered into the computer, and means and standard deviations will be delineated and compared before and after therapy.

SCAS -- 3 Lowe's Syndrome

Kristina Meerovich (UN) & Renee Fabus, Department of Speech, Brooklyn College-CUNY, Brooklyn, NY

"Lowe's Syndrome" is named after Doctors Lowe, Terrey, and MacLachlan who first described it in 1952 at the Massachusetts General Hospital in Boston. Because of the three major organ systems involved (eyes, brain, and kidney), it is also known as OCRL (Oculo-Cerebro-Renal) syndrome. The syndrome is caused by a DNA mutation - a single defective gene on the X-chromosome - that results in the lack of an enzyme. The mutation can occur without any family history (a spontaneous mutation) or may be inherited through the mother. Babies are born with bi-lateral cataracts, hypotomia (muscle weakness), kidney problems (wasting of essential nutrients) impaired growth, intellectual impairment and later may suffer brittle bones, arthritis, rickets, epilepsy (seizures) and behavior problems (autistic spectrum disorder). The Lowe's child is usually short in stature, this is due to renal disease. Some boys are mildly affected and able to attend normal schools with special needs help, while others are severely affected with loss of sight and mobility. Medical care focuses on managing the kidney problems that develop. The eye cataracts are surgically removed as soon as possible, even before the infant is one month old, so that the visual parts of the brain can develop normally. Physical, occupational, and speech therapies can help individuals reach their individual potentials for development.

This is a rare syndrome, which has been recently identified. Due to this fact there is not a lot of research on the syndrome. The case study that I am working on involves M.F., a 13-year-old male client diagnosed with Lowe's Syndrome that is currently receiving speech therapy. Although, Lowe's Syndrome is not primarily a disorder of speech, speech is greatly affected in the Lowe's patient, due to poor oral motor skills. The improvement of the five components of language are a main focus of therapy, primarily syntax (grammar) and pragmatics skills. Other important goals of therapy consist of behavior modification and cognitive capabilities.

SCAS - 4 EFFECTS OF EXECUTIVE FUNCTIONS ON SOCIAL BEHAVIOR AND SELF ESTEEM

Diana Sanchez (UN) & Dr. Klara Marton Department of Speech Communication Arts & Sciences, Brooklyn College-CUNY, Brooklyn, NY 11210

The purpose of this study was to investigate the effects of executive functions – planning, inhibition, emotion control- on school-age children's social behavior and social self-esteem. This study examined the above relationships in two groups of children: individuals with specific language impairment (SLI) and their typically developing peers.

It was hypothesized that a weakness in executive functions, such as perspective taking influences both children's social interactions with their peers and their social self-esteem. Existing data of 38 children (7-10 years) were analyzed.

Children with SLI showed more difficulties in social situations than their typically developing peers. Their social deficits are related to weaknesses in executive functions. These children performed more poorly than their typically developing peers in planning and emotion control, however, the groups did not differ in inhibition. Every participant showed the most difficulties in inhibition and performed with the highest scores in planning. The groups also differed in social self-esteem, which showed a positive correlation with children's emotional control.

BIO 1 - COMPUTATIONAL MODELING OF GAB FAMILY PH DOMAINS

Ewa Wywial (GRAD) & Dr. Shaneen M. Singh, Department of Biology, Brooklyn College – CUNY, Brooklyn, NY 11210

The Grb-2 associated binder (Gab) adaptor/scaffolding molecules have no enzymatic activity, but they contribute to the localization and/or amplification of signal transduction pathways. The Gab family currently comprises mammalian Gabl, Gab2, Gab3, the Drosophila homolog Daughter of sevenless (DOS), and the Caenorhabditis elegans homolog Suppressor of Clear-1 (Soc-1). There are many studies to date that link the Gab family proteins to oncogenic transformation. Gab I has been implicated in breast, thyroid, and leukemia tumors. Gab2 has been shown to play a role in Bcr-Abl transformation, which causes chronic myelogenous leukemia (CML) and breast cancer. It has been suggested that Gab I transforming potential may be activated by the loss of its pleckstrin homology (PH) domain, which is the most conserved region within various Gab family members. Many PH domains bind membrane phosphoinositides but the exact role of PH domain is still unknown. However, it is apparent that mutation or deletion of the PH domain has a drastic effect on the functioning of Gab proteins, leading to aberration in signaling cascades and oncogenesis. We have characterized 21 Gab family PH domains by 1) predicting secondary structures; 2) creating homology models using a number of different approaches, i.e. homology modeling, protein threading, multiple sequence and structure alignments, sequence to profile alignment, and loop refinement; 3) generating the electrostatic potential contours; 4) searching for a consensus sequence, which predicts high affinity binding to PI3-kinase products. We present the detailed characterization of these PH domains and the analysis of their physical interactions with membrane phosphoinositides.

BIO 2 – GENOME-WIDE ANALYSIS OF THE PLECKSTRIN HOMOLOGY DOMAINS OF DICTYOSTELIUM DISCOIDEUM

Marc Saint-jour, Jr. (UN) & Dr. Shaneen Singh, Bioinformatics, Biology Department, Brooklyn College-CUNY, Brooklyn, NY 11210

Pleckstrin Homology (PH) domains are small protein modules, present in many proteins involved in cellular processes in which membrane association plays an integral role e.g. signal transduction, vesicular trafficking and cytoskeletal rearrangements. Many PH have been implicated in binding phosphoinositides, but the physiological role of many others has not been established. The present study focuses on the detailed analysis of all the PH domains in the organism *Dictyostelium discoideum*. Genomic scale modeling of the PH domains from various organisms can provide invaluable clues regarding their function as well as how the subtleties and complexities of the membrane targeting functions of the PH domains evolved over time; the current work is part of ongoing effort in the lab to accomplish the same. We have used computational databases and tools to predict the secondary structure of all forty-two *Dictyostelium discoideum* PH domains identified by the SMART database of protein domains, build and evaluate their three-dimensional models and study their electrostatic profiles. Our computational strategy of integrating the information available on sequence, structure and function and combining this with modeling and biophysical characterization allows us to make new biological predictions based on the models we have generated which can then be experimentally validated.

BIO – 3 SEED COAT SCARIFICATION

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People around the world love having" green thumbs" and want their plants to grow faster. Frank A. Blazek, Jerry Parsons, and the Australian Botanic Gardens experimented by scarifying, meaning they broke up and loosened the surface of the seed coats to see the effects.
At Texas A&M University in Dallas, Tim D. Davis, Steven W. George, Abha Upadhyaya and Jerry Parsons put sees in sulfuric acid for 120 minutes and sowed them. In that experiment, the seeds got moisture, which resulted in an 85-90% emergence. The researchers found that the acid scarification had hastened the growth and the acid created pores in the seed coats.
Professor Frank A. Blazich from Department of Horticultural Science in North Carolina State University also put in a glass, but soaked them in sulfuric acid. The seeds were stirred and left to soak for 10 minutes to 2-3 hours. The seeds were removed from the acid, washed, and sown. He performed another experiment where the seeds were boiled, soaked, and sown. This resulted in the seed, looking dull.
Australian Botanic Gardens-ACT Grass Project had nine-month-old seeds stored, for which the seed coat was removed. Germination was faster in that experiment and found that seeds with hard coats worked very well in the experiment.
The problem of the experiment sis, "How does taking off the seed coat affect seed growth?" The lima beans were soaked for 10 hours in water, removes the seed coats for each of them, the n the embryo plants will grow faster was offered as a hypothesis. Seeds, water, cups, and soil was needed. In the experiment, the seeds will get all of the factors needed such as moisture and air.
After the experiment, it was found that the barer the seeds are, the slower they grow. For instance, the root for seed #1, for which all the seed coat was taken off, grew 1.5 cm while a 16% scarified seed's emergence of root was 3.6 cm. According to the data, the hypothesis, therefore, was incorrect. This research helps farmers who think taking off the seed coat will help them. However, this experiment argues against this issue.

BIO – 4 A CONSTRUCT FOR GFP-TAGGING OF MYOSIN IN *TETRAHYMENA*

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Green fluorescent protein (GFP) was discovered in the jellyfish *Aequorea victoria,* and it is this protein that causes the jellyfish to fluoresce green in the presence of blue light. The GFP can be attached to a gene of interest and used as a gene reporter. Fluorescence microscopy localizes GFP-tagged proteins within living cells. In order to attach GFP to a protein, the gene of interest must be modified so that it is linked to the gene for GFP, all within a construct. Flanking regions of the construct will allow it to replace the endogenous gene through homologous recombination. In the present study, Green Fluorescent Protein (GFP) is used as a tag for Myo1, a myosin in the ciliated protozoan *Tetrahymena.* The purpose of studying Myo1 in *Tetrahymena* is to obtain a better understanding of myosin function in diverse biological systems. Molecular tools of recombinant DNA technology are being used to create a gene replacement construct that contains the *MYO1* gene fused to the gene for GFP. The construct will be introduced into the macronucleus of *Tetrahymena* by biolistic bombardment. The transformed *Tetrahymena* will express a Myo1::GFP fusion protein, which will exhibit

green fluorescence. Confocal microscopy will localize Myo1 and determine its dynamic nature throughout the cell cycle. Knowledge of Myo1 localization will be useful in determining its function. Supported by NSF and NIH-MARC Program.

BIO – 5 CREATION OF A TRUNCATED MYOSIN GENE (MYO1) IN *TETRAHYMENA THERMOPHILA*

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Myosins are multimeric complexes consisting of one or two heavy chains complexed with one to several light chains. In all known myosins, the energy transducing head domain is coupled to a regulatory neck region and a tail domain. The tail domain contains the catalytic site for ATP hydrolysis and an actin-binding site. For non-filament forming myosins (unconventional myosins), the tail domain contains regions that enable the myosin to interact with a specific subcelluar component(s). Myo1 is an unconventional myosin in *Tetrahymena*. Genomic knockout of this gene revealed that Myo1 is required for directed motility of phagosomes. How Myo1 interacts with phagosomes to produce directed motility is unknown. One hypothesis is that the FERM motif in the tail domain of Myo1 provides a binding site for phagosome-associated actin. In order to test this hypothesis, molecular tools of recombinant DNA technology are being used to create a construct that will transform *Tetrahymena*. The construct will be introduced into the macronucleus of *Tetrahymena* by biolistic bombardment. Flanking regions of the construct will allow it to replace the endogenous gene through homologous recombination. The transformed strain will express a truncated Myo1 that lacks a FERM motif. Phagosome motility will be characterized in the transformed cells.

BIO – 6 INVESTIGATING THE METABOLISM OF PRO-VITAMIN A ACCUMULATION IN *DUNALIELLA BARDAWIL* (GREEN ALGA)

Jasmeen Kaur (UN) & Juergen E. W. Polle Department of Biology, Brooklyn College– CUNY

The green alga *Dunaliella bardawil* is one of the most important sources of Pro-Vitamin A (=β-carotene). However, the molecular basis of β-carotene over-accumulation in the alga is still unanswered. The main purpose of this project is to isolate the entire gene sequence of one enzyme called Phytoene Synthase (PSY). It catalyzes the synthesis of phytoene which is the first carotenoid in the biosynthetic pathway for all carotenoids. After the formation of phytoene, a sequence of reactions in the carotenoid biosynthetic pathway eventually leads to production of β-carotene. In order to clone the full length PSY gene, we used an available cDNA sequence from a database (Genebank, NCBI). This sequence was used for primer design to amplify the PSY gene sequence by Polymerase Chain Reaction (PCR). Sequencing of the PCR products revealed that the PSY gene of *D. bardawil* contains at least five exons and four introns. Once the full length PSY sequence is obtained, we will be able to use it for comparative promotor studies to determine regulatory elements responsible for gene expression.

BIO – 7 THE LONG TERM BEHAVIORAL EFFECTS OF ETHINYL ESTRADIOL ON FOUR –SPINED STICKLEBACKS

Tina Kuroiwa (GRAD) & Dr. Jennifer Basil, Department of Biology, Brooklyn College, CUNY

Endocrine disrupting compounds (EDCs) can affect the behavior of living organisms. Ethinyl estradiol, a synthetic estrogen, is a common and potent EDC pollutant in the aquatic environment. In this study, *A. quadrucas*, the four-spined stickleback, was exposed to an environmentally relevant level of EE_2 (100 ng/L) for 60 days and evaluated for long-term (100+ days post exposure) behavioral effects for activity and aggression levels. Exposed fish had significantly ($P < .000$) higher activity and aggression levels compared to the control fish.

BIO – 8 MOLECULAR MODELING STUDIES OF *CHLAMYDOMONAS REINHARDTII* LHC PROTEINS

StacieAnn Newell (UN), Jurgen Polle, Shaneen Singh, Department of Biology, Brooklyn College

The light-harvesting complexes (LHC) are a family of chlorophyll-binding proteins that capture and funnel excitation energy into the reaction centers that drive photosynthesis in plants and algae. LHC proteins share significant sequence similarity and potentially possess the same structural fold. However, distinct pigment organization properties, protein-protein interactions and modes of regulation of light-harvesting events for various LHCs suggest variations in the three-dimensional structure and biochemical properties of different LHC proteins based on differences in their primary structure. Although sequence data regarding the diversity in LHC proteins is rapidly accumulating, there is very little known in terms of the differences in structural properties of different LHC proteins and how these translate into different functionalities.

To elucidate the structural bases for the differences in various LHC proteins, we modeled and analyzed the three dimensional structures of members of the LHCI and LHCII family of proteins in the organism *Chlamydomonas reinhardtii* using a number of bioinformatics approaches including comparative modeling, sequence to profile analysis, and multiple sequence and structure alignments. Our comprehensive modeling study provides detailed functional annotation for the *Chlamydomonas* LHC proteins including differences in structural features and biochemical properties such as potential phosphorylation sites that may be involved in regulation of function of the LHCs.

BIO – 9 IDENTIFICATION OF ARABIDOPSIS THALIANA MUTANTS RESISTANT TO AGROBACTERIU M TUMEFACIENS – MEDIATED TRANSFORMATION

Lourdianie Pierre-Charles (UN) , Nel Trasybule, Khudeja Mir, and, Theodore Muth, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY

Agrobacterium tumefaciens is a typical soil bacterium that causes crown gall disease in a variety of plant species. *A. tumefaciens* is capable of recognizing wound sites on a plant by detecting chemicals produced during the wound response of the plant. Laceration of the plant tissue causes the production of phenols and sugar molecules which in turn trigger not only the chemotaxis of the bacteria towards the injury, but the

processing of the tumor inducing plasmid (Ti plasmid) as well as the expression of certain virulence genes. It is known that the bacteria insert a segment of their Ti plasmid, the transfer DNA or T-DNA, into the plant at the wound site. The integration of the T-DNA allows for the production certain plant hormones. It is the uncontrolled plant cell division stimulated by the overproduction of growth hormones that leads to the formation of tumors. Currently there is very little known about how *A. tumefaciens* attach to plant cells and transfer the T-DNA into these cells. Through experimental analysis we seek to identify mutant lines of *Arabidopsis* that are resistant to transformation, or hypersensitive to transformation. Identification of resistant or hypersensitive plant types is done through root tumor assays as well as GUS assays. It is our hope that identification of *Arabidopsis* genes in this screen of mutants will allow a better understanding of how the bacterial genetic material is transferred into the plant genome.

BIO – 10 HYALURONIDASE INHIBITION AND ANTI-INFLAMMATORY POTENTIAL OF ECHINACEA AND OTHER "MEDICINAL PLANTS"

Renelle Pointdujour (UN) & Roy McGowan, Department of Biology, Brooklyn, NY

Echinacea species are among the main investigative targets, because of their value as immunostimulants. The therapeutic effects of Echinacea have been assigned to the presence of caffeic acid derivatives such as cichoric acid, echinacoside, chlorogenic acid, and lipophilic polyacetylene-derived compounds. Cichoric Acid has been shown to possess phagocytotic stimulatory activity in vitro and vivo, while echinacoside has antibacterial and antiviral activity. Cichoric acid has been shown to inhibit hyaluronidase and to protect collagen type III from free radical induced degradation.

Hyaluronic Acid surrounds healthy cells and prevents the penetration of pathogenic organisms. Certain bacteria secrete an enzyme called hyaluronidase which depolymerizes hyaluronic acid. Hyaluronic Acid is measured by its ability to form turbidity with an acid albumin solution. Turbidity is a function of hyaluronic acid concentration and can hence be related to enzyme activity. One unit corresponds to a USP/National Formulary Unit and is referenced to a standard USP/NF hyaluronidase. Several buffers were prepared. Tubes with different amounts of the diluted enzyme, hyaluronidase, were placed in a spectrophotometer and the respective absorbance were measured. The amount of hyaluronic acid remaining after digestion by the hyaluronidase was determined using a standard curve.

Cichoric Acid inhibits inflammation and infection by promoting phagocytosis and inhibiting hyaluronidase. Experiments have shown that there is a direct relationship between levels of Cichoric Acid and hyaluronidase inhibition. Cichoric acid is the major inhibitor of hyaluronidase activity. There is a direct correlation between inhibition and cichoric acid content.

BIO- 11 POSITIONING NUCLEAR HORMONE RECEPTOR HR3 INTO THE GENOMES OF TWO MOSQUITOS

Kathryn Ray (UN), Dmytri Olshansky, **Ted Carryl** & James Nishiura

Evolutionary conservation between genomes allows us to compare sequence data in order to discover potential regulatory and functional motifs. This is informative both at the DNA level and at the level of the encoded proteins.

Anopheles gambiae is the major vector of malaria, while *Aedes aegypti* is the vector of Yellow fever and Dengue fever. In this project we place the nuclear hormone receptor HR3 into the recently sequenced genomes of these two closely-related mosquitoes. The orphan receptor HR3 plays an important role in the processes of insect development and the timing of metamorphosis, and is homologous to the human nuclear receptor ROR.

This work allows an evaluation of the following features of HR3 in three *Dipteran* species:
∑ relative size and genomic context
∑ splice variation
∑ isoforms (presence/absence)
∑ intron/exon structure
∑ potential common regulatory features.

We compare our findings in mosquito genomes with the extensively-annotated fly HR3 gene locus, using it as model This comparison offers insight into the essential (conserved) features of the gene, and also into evolutionary divergence that may underlie developmental differences between the two closely related species of mosquito during metamorphosis,. This work may suggest future experimental design to investigate HR3 function *in Aedes aegypti.*

BIO – 12 DETECTION OF TRANSIENT AGROBACTERIUM-MEDIATED TRANSFORMATION OF *ARABIDOPSIS THALIANA* USING AN ENZYMATIC MUG ASSAY

Katherine E. Bernal (UN) & Theodore R. Muth, Department of Biology, Brooklyn College-CUNY, Brooklyn, NY 11210

Crown gall disease is a type of cancer in plants caused by the soil bacterium *Agrobacterium tumefaciens. A. tumefaciens* has the unique ability to transfer a piece of its DNA, the T-DNA, into the plant genome. The T-DNA carries genes that code for plant growth hormones, which, when expressed in infected plant cells, leads to excess production of hormones and subsequent uncontrolled cell division that results in a tumor (called a gall in plants). The goal of this study is to use the P-glucuronidase gene (also known as GUS or *uidA)* as a marker gene for transient transformation in *Arabidopsis* root segments. The method of detecting transient transformation is a fluorimetric assay known as the MUG assay. In this assay we first inoculate plant roots with *Agrobacteria,* allow time for transformation and gene expression, and then release the GUS enzyme from the infected plant cells by lysing the root segments in extraction buffer. The 4-MUG substrate is then added to the solution. If the transformation was successful the newly introduced GUS enzyme hydrolyzes the substrate, producing a fluorescent product under basic conditions. The amount of fluorescence that we detect allows us to determine the efficiency of the transient transformation. This method provides quantitative results unlike other assays that have been used previously. It is hoped that this technique will help us in exploring the factors that can influence Agrobacterium-mediated transformation.

BIO – 13 TO BIND OR NOT TO BIND?

Esan Wilkinson (UN), Nicole Romeo, Stanton B. Gelvin* & Theodore Muth, *Dept. of Biological Sciences Purdue University, Dept. of Biology Brooklyn College, CUNY Brooklyn,NY

BL-1 is an *Arabidopsis* ecotype that exhibits significantly reduced transformation and attachment by *Agrobacterium tumafeciens.* The poor binding ability may be attributed to reduced biofilm formation on the root surface of this ecotype. RAT1, identified by the Gelvin lab, is an *Arabidopsis* mutant that has a phenotype similar to BL-1. The poor binding ability exhibited by the *rat1* mutant results from a mutation in the promoter region of the gene that codes for the protein AGP17. Thus it is possible that AGP17 promotes bacterial attachment and potentially the subsequent biofilm formation. To examine the role of AGP 17 in promoting biofilm formation and attachment of A. *tumafaciens,* we have inserted the AGP17 gene into the BL-1 ecotype. We are particularly interested in testing whether the expression of AGP17 in the BL-1 ecotype leads to levels of biofilm formation, and consequently a higher transformation efficiency, as seen in most wild type *Arabidopsis* ecotypes. Seven distinct AGP17-expressing transgenic lines were generated by the floral dip method. Thus far we have not been able to show that AGP 17 increases biofilm formation. However preliminary results suggest that expression of AGP 17 in the BL-1 ecotype increases the transformation efficiency of some of our transgenic lines. We would also like to transform tobacco BY-2 cells using *Agrobacterium tumafeciens* expressing a putative AGP17 construct. If the protein is expressed in tobacco BY-2 cells, we can purify it and perform further analysis of AGP17.

BIO – 14 QUANTITATIVE MEASUREMENTS OF CELL ATTACHMENT OF AGROBACTERIUM TUMEFACIENS TO ARABIDOPSIS THALIANA WITH THE USE OF A FLOW CYTOMETER

Anna Petrovicheva & Leslie Aguirre (UN) & Theodore R. Muth, Department of Biology, Brooklyn College -CUNY, Brooklyn, NY 12210

Agrobacterium tumefaciens is a bacterium that is able to infect a diverse array of plants. It attaches to plant roots and transforms the plants cell to induce crown gall tumors, a type of plant cancer. The plants used in this experiment are Arabidopsis. thaliana, a member of the mustard family.

The goal is to create an efficient quantitative measurement assay that improves upon the past methods. Agro infection assays using transformation leading to fluorescence and tumor formation are informative, but these do not measure actual attachment. The previous attachment assays that have been done using microscopy, give a more qualitative than quantitative result, and colony counts are labor intensive and measure only the numbers of living bacteria that can be released from roots. Some of the attached bacteria may be killed, or enter a dormant state, in the preparation process. The flow cytometer measures the amount of particles in a media sample and determines their size and fluorescence in a data sheet of the program. Using the flow cytometer, the number of bacteria extracted from the root surface will be measured. From this data, we can identify mutant bacterial clones, or mutant Arabidopsis lines, that exhibit enhanced attachment or inhibited attachment.

BIO – 15 ABILITY OF FRESHWATER CRAYFISH PROCANBARUS CLARKII LEARN, REMEMBER, AND DISTINGUISH BETWEEN DIFFERENT SURFACES ON THE BASIS OF THE PRESENCE OR ABSENCE OF ANGULAR CORNERS

Kanwal Gulzar (UN) & Dr. Jennifer Basil Department of Biology, Brooklyn College-CUNY, Brooklyn, NY

Crayfish have one pair of long antennae, used in tactile exploration, which are located on the head as well. Our lab has previously demonstrated that crayfish are able to collect information using their antennae from an experimental environment the explore for 40min and can retain this information for 24h by forming short- and long-term memories of the spatial layout, in the absence of visual or smell-related cues. We also observed that they spend a significant amount of time during exploration touching objects, especially corners, with their antennae. Having observed tactile learning and memory formation in crayfish, we now hypothesize that crayfish can use their antennae to learn and distinguish between different surfaces on the basis of the presence or absence of angular corners. To test our hypothesis, we have designed an experiment in which each animal is exposed to 4 different kinds of 3-D surfaces, one at a time. Exposure to each surface occurs for 40min at 24h intervals for 4 days. Through previous experiments, we have determined that it takes an animal at least 40min to explore their experimental tank, and any change in exploratory pattern occurs by the 4th trial. The surfaces being tested are A: interior of a rectangular object, B: exterior of a rectangular object, C: interior of a cylinder, D: exterior of a cylinder. These are Plexiglas objects that have the same surface area. Only A has angular corners. B serves as a control for A because it has corners but they are not angular. C has no corners and serves as a control for the interior shape of A. D serves as a control for B because it has the same exterior surface as B, but lacks corners. For A and C, the interior of the surface only has enough space to create an interior corner but not enough space to fit even half of the body of the animal. Each animal is subjected to a total of 24 trials with the order of exposure to different surfaces being ABACAD. Surface A is reintroduced before introducing any new surface so that a direct comparison between surface A and other surfaces can be made. Our preliminary data suggested that crayfish can indeed distinguish between a surface with angular corners and a surface with non-angular corners, as indicated by the number of touches and the amount of time spent on each kind of surface. We are currently running the experiment described on 12 animals to collect more data.

HNS - 1 SEVERE COMBINED IMMUNODEFICIENCY: NEW GENE THERAPY TREATMENTS USING ADENO-ASSOCIATED VIRUS VECTORS

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Severe Combined Immunodeficiency (SCID) is a rare genetic disorder characterized by improper immune development. Recent clinical trials have shown that gene therapy is a viable cure for SCID. However, improper integration of the therapeutic gene due to unreliable viral vectors remains a prominent risk factor. The adeno-associated virus (AAV) is a special type of virus that is studied for its possible role in gene therapy treatments. AAV is useful because of its ability to infect various cell types, the lack of disease manifestation in humans due to an inability to reproduce without a helper virus,

and its ability to integrate its DNA site-specifically onto a locus on chromosome 19 that is functionally silent. AAV's specificity is due to a series of helicases known as the Rep proteins, which are important for numerous viral functions, including DNA integration into the host cell. The Rep 68 protein has been shown to bind to DNA while Rep 40, which is structurally identical with the exception of an N-terminal domain, does not. This study was conducted in order to find the relationship between this N-terminal and DNA binding.

HNS – 2 EFFECTS OF VERY LOW-CARBOHYDRATE/HIGH-FAT DIETS ON CONTROL OF BLOOD GLUCOSE LEVELS IN OBESE RATS

Kira S. Clarke (UN); Kathleen V. Axen, PhD, CDN[1]; Malki Miller, B.S; Jennifer Hernandez, A.S; Virna Hallak; Danielle Jones; Sonal Noticewala[2]; Mark Phillips
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An increasing number of obese individuals, at risk for many diseases, follow a very low-carbohydrate, high-fat (VLC-HF) diet for weight loss. Our previous research into the effects of the diet found that it greatly impaired glucose tolerance and promoted insulin resistance in obese and lean rats. The current research compared calorie-restriction using the VLC-HF diet with that of an isocaloric high-carbohydrate, low-fat (HC-LF) diet in obese, male Sprague-Dawley rats. A lean control (C) group was given the HC-LF diet *ad libitum*. Tests for glucose and insulin tolerance, and body composition were assessed at various times on the diets to investigate metabolic defects. During the glucose tolerance test (GTT) at week 8, the obese (HF) rats showed elevated (HF>C) plasma glucose levels. At weeks 11 and 13, rats on the VLC-HF diet displayed higher glucose levels than rats on the isocaloric HC-LF diet. Similarly, at week 15, GTT indicated that the VLC-HF rats had impaired ability to lower blood glucose, similar to that in the original obese group, whereas HC-LF rats showed greater ability than the lean C rats. Therefore, the VLC-HF diet lead to impaired ability to control blood glucose levels throughout the long-term study. This suggests that the diet either promotes insulin resistance or reduces insulin secretion or both. Our analysis of additional data from the study may answer that question. With these interesting findings, nutritionists may now have second thoughts on placing a person on the diet for a prolonged period of time.

HNS- 3 THE EFFECT OF TEA EXTRACT ON CYP1A2 GENE EXPRESSION IN HEPG2 CELLS AND IMPLICATIONS FOR DIOXIN SEQUESTRATION.

Dalery Grullon (UN) and Jean Grassman PhD, Department of Health and Nutrition Sciences, Brooklyn College-City University of New York, Brooklyn, NY 11210

Dioxins are persistent environmental toxicants which bioaccumulate. Humans are exposed to these fat-soluble compounds when they consume animal fats. The liver plays a major role in detoxification, but high exposure can harm hepatic tissues. Dioxins induce CYP1A2 expression; in turn dioxins binds to CYP1A2 and are sequestered within the liver. CYP1A2 expression can also be induced by dietary constituents. This study focuses on the effect of tea extract, epigallocatechin gallate (EGCG), in HepG2 cells. HepG2 cells were treated with different concentrations of EGCG, 0μM, 1μM, 5μM, and 25μM. Real-time RTPCR was used to measure the levels of CYP1A2 gene expression. Based on the results, EGG might alter CYP1A2 expression and affect the sequestration of dioxin in the liver. These results may have implications for consumers of tea.

HNS - 4 QUANTITATIVE ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS EXPOSURE IN TRANSIT WORKERS AND CONTROLS

Jennifer Hernandez (UN), & Regina Santella, PhD. Columbia University, NY.

Monitoring environmental and occupational exposure of polycyclic aromatic hydrocarbons (PAH), a class of chemical carcinogens is commonly done by analysis of urinary excretion. An example of a PAH is benzo[a]pyrene (BP); exposure sources include cigarette smoke, diet or occupation. High levels of PAH exposure are associated with lung cancer. We intend to determine whether there is a correlation between levels of PAH in Transits workers and their job descriptions. We will investigate the hypothesis that the levels of personal exposure to PAH through biomarkers vary in the workers environment dependant on job description. PAHs were extracted from the urine samples by Sep-pak and C18 cartridge chromatography of 45 subway workers, 10 Bus drivers and 22 Lamont-Doherty office workers; the control group. Competitive ELISA will be used to monitor the levels of PAHs in urine samples of subway workers' with antibody 8E11 generated against BP. Results from this study will help assess the potential for health hazard in Transit workers according to their job description.

HNS – 5 ANALYSIS OF EXHALED NITRIC OXIDE AND SERUM IMMUNOGLOBULINS IN PATIENTS WITH ASTHMA AND HIV-1 DISEASE BEFORE AND AFTER HAART

Michelle Kan (HS), Midwood High School, Brooklyn, NY & Dr. Maja Nowakowski, SUNY Downstate Medical Center, Brooklyn, NY 11203

The objective of this study is to determine how frequently HIV-1 infected subjects in STAR suffer from asthma and allergic diseases, compared with HIV-1 seronegative age-matched healthy subjects. This will be accomplished by a retrospective review of medical records and statistical analysis of the data (records of asthma and/or allergy symptoms, appropriate test results, and medications). This study will include determinations of amounts of nitric oxide (NO) in exhaled breath of selected subjects, immunological analysis of serum samples collected at various times (concentration of immunoglobulins IgM, IgG, IgA, and IgE, and their reactivity against HIV-1 components as visualized by Western blots). The second objective is to determine if HAART therapy is associated with changes in the prevalence of asthma and allergic disease in this patient population, as well as with changes in exhaled breath NO and serum samples. It is expected that the results of these studies will help to understand the impact of HAART therapy on specific antibody responses to HIV-1, on asthma and allergic disease among subjects with HIV-1, and relate the findings to natural history of HIV-1 disease.

HNS – 6 EFFECTS OF POLYBROMINATED DIPHENYL ETHERS (PBDE) ON DIOXIN INDUCIBLE GENES

Carla R. McGee (UN) &Jean Grassman, Department of Health and Nutrition Sciences, Brooklyn College-CUNY, Brooklyn, NY 11210

Polybrominated diphenyl ethers (PBDE) are man-made flame retardants used in commercial and consumer products such as furnishings, textiles, computer casings and fabrics which are used to reduce these products ability to burn. Since they are not bound to products, they have migrated into homes, air, water and soil. The detection of PBDEs in human tissues, including breast milk, indicates the occurrence of widespread

exposure. Concerns have arisen that the PBDEs may be toxicologically similar to dioxins. Dioxins are carcinogens, which induce cytochrome P450s and produce developmental, reproductive, immunological and hormone disrupting effects. This study measures the effect of PBDEs on the expression of the dioxin inducible genes AHR, CYP 1 AI, CYP1A2, and CYPIB1. Immortalized liver cells, HEPG2 cells, were cultured in vitro in the presence of 2, 5, and 20 u M mixed PBDEs (Great Lakes DE-71). Total RNA was extracted from the harvested cells and reverse transcribed. Gene expression was measured by real-time RTPCR of the DNA. This research provides evidence of whether PBDE behave similarly to dioxins and alter transcriptional expression of dioxin-inducible genes in human cells.

HNS – 7 THE EFFECTS OF CAFFINE ON CYP1A2 EXPRESSION ON HEPG2 CELLS AND THE RELEVANCE FOR DIOXINS AND DIOXIN-LIKE COMPOUNDS

Maria Mercedes (UN) & Jean Grassman, PhD, Department of Health & Nutrition Sciences, Brooklyn College – CUNY, Brooklyn, NY

The purpose of this project is to study the effects of caffeine on CYPIA2 gene expression in HEPG2 cells. CYPIA2 is a member of the Cytochrome P450 family of oxidizing enzymes that is induced by dioxins and dioxin-like PCBs. Dioxins are widely dispersed environmental carcinogens that also cause alterations in developmental and hormone functioning. Based on observations from animal studies, CYP1A2 may increase exposure to dioxins by causing them to be sequestered in the liver, a target organ. Common dietary constituents, such as caffeine, may induce enzymes and if so, could contribute the sequestration of dioxins. To test whether this is possible in humans, we treated an immortalized human cell line, HEPG2 cells, with 0.1 mM, 0.5mM, and 2Mm caffeine. RNA was then isolated from the HEPG2 cells and reverse transcribed. CYP 1 A2 expression was then quantitatively measured by Real-Time PCR. If we find that caffeine induces CYPIA2, it will be evidence that coffee consumption augments sequestration of dioxins in the liver and suggests that limiting coffee consumption could reduce dioxin exposure.

HNS - 8 EFFECTS OF A LOW-CARBOHYDRATE DIET ON LEPTIN SENSITIVITY IN RATS

Malki Miller (GRAD) & Dr. Kathleen Axen, Kira Clarke, Jennifer Hernandez, Virna Hilak, Danielle Jones, Sonal Noticewala & Mark Phillips, Department of Health and Nutrition Sciences, Brooklyn College-CUNY

Leptin, a hormone produced by adipocytes that is involved in energy homeostasis, acts to regulate body weight in part by decreasing food intake. Decreased sensitivity to leptin has been associated with consumption of a high fat diet. The purpose of this study was to determine whether the low-carbohydrate weight loss diets popular today, which are typically high in fat, would still be able to correct the obesity-induced leptin resistance in rats. Obesity was induced in rats fed a high fat (HF) diet for 8 weeks. Obese rats were then divided into a high carbohydrate weight loss diet (HC), pair fed to match kcal intake with a low-carbohydrate weight loss diet (VLC). After 8 weeks on their respective weight-loss diets, rats were given leptin injections (.45mg/kg) and allowed free access to diet. Food intake was measured after six and twenty four hours. Rats were then maintained for 2 weeks on ad-lib feeding on their respective HC/VLC diets and re-tested with leptin

injections. The first series of leptin injections significantly decreased 6h food intake only in HC rats. After allowing ad-lib access to their respective diets and gaining a significant amount of weight, neither HC or VLC groups exhibited reduction in food intake in response to leptin injections, although the HC group demonstrated a slightly greater sensitivity to leptin in the 6-24h period. Results suggest that the weight-loss phase of low-carbohydrate diets popular today may result in reduced sensitivity to the anorectic effects of leptin.

HNS - 9 USING FOCUS GROUPS TO EXAMINE EARLY PREGNANCY LOSSES

Dr. Betty W. Levin and **Adashima Muhammad** (GRAD), Department of Health and Nutrition Sciences, Brooklyn College-CUNY, Brooklyn, NY 11210

The biological causes of *early pregnancy loss* have been widely researched by medical experts. However, the psychological impact of *early pregnancy loss* on women who experience miscarriages has been understudied. Yet, such losses affect nearly 20% of first trimester pregnancies. The study will be conducted under a collaboration of Brooklyn College and New York Methodist Hospital. The first step was a comprehensive literary review. We will then design and coordinate focus groups of women from diverse backgrounds who experienced miscarriages (*early pregnancy loss*) in the past 6-18 months. Beginning in June, the research sample will be selected from New York Methodist Hospital, which is located in Park Slope, Brooklyn. Upon analysis of the data from focus groups and the literature review, we will seek to develop hypotheses about the importance of variables such as: age, culture, religion, socioeconomic status and fertility history. Ultimately, our research team will seek to obtain qualitative and quantitative data to examine factors affecting the psychological impact of *early pregnancy loss*.

Sample: Women who have experience *early pregnancy loss* in the past 6 to 18 months. Sampling Procedure: Gain access to through OB/GYN Department of New York Methodist Hospital. Data gathering: The focus groups will be recorded and transcribed. After the focus group, each woman will complete a demographic background sheet and validated psychological instruments. Data analysis: SPSS will be used to analyze responses to the psychological instruments. Componential data analysis will be conducted and discriminate function analysis will be utilized to obtain clinically meaningful profiles.

HNS – 10 PLASMA TRIGLYCERIDE LEVELS OF RATS ON VERY LOW CARBOHYDRATE DIET VS. HIGH CARBOHYDRATE DIET IN THE POSTPRANDIAL STATE

Sonal Noticewala (HS), Dr. Kathleen Axen, Virna Hallak, Malki Miller, Mark Phillips, Kira Clarke, Jennifer Hernandez, and Danielle Jones, Department of Health and Nutrition Sciences, Brooklyn College-CUNY, Brooklyn, NY 11210

One of the risk factors for cardiovascular disease and Type II Diabetes is an elevated level of triglycerides in blood. Studies have reported that a very low carbohydrate (VLC) diet reduces triglyceride levels. However, the data are always reported for the fasting state. This study investigated the blood triglyceride levels in the postprandial state, reasoning that triglycerides in the diet will be absorbed and will elevate triglyceride levels. For the first eight weeks of the experiment, 56 rats consumed a high fat (HF) diet

containing 15% carbohydrates (C), 25% protein (P), and 60% fat (F). By week nine, 21 rats were placed on a VLC diet containing 10% C, 30% P, and 60% F and another 21 rats were placed on a HC diet containing 60% C, 25% P, and 15% F. Both groups of rats had the same caloric intake. On week 19, postprandial triglyceride levels were measured in 6 of the 21 rats on the VLC diet and HC diet. The rats were food-deprived overnight and then given 30 calories of their diet to ensure that all the food was eaten. Blood samples were obtained from the tails of the rats in 45 minute intervals for up to 90 minutes and measurements were acquired by using a triglyceride assay. The assay revealed that postprandial triglyceride levels were significantly higher in rats on the VLC diet versus those on the HC diet, suggesting that VLC diets may not be as effective in lowering triglyceride levels as commonly thought

HNS - 11 TRINIDAD AND TOBAGO

Zola Kai Pollard (HS) & Janice Baronowski , Brooklyn Technical High School, Brooklyn, NY

The purpose of this study is to find out if Trinidad and Tobago is headed towards the same path as Haiti in regards to HIV infections. Utilizing the United Nations AIDS (UNAIDS) and organization that reports on the epidemic, records were obtained, studied and compared. Information from both countries was collected from the same scientific sources. The results indicated that Haiti had a higher HIV infection prevalence rate than Trinidad & Tobago. The average prevalence rates for Haiti in rural areas during the time period from 1993-2002 was 2.64%. The average prevalence rate for Trinidad rural areas during the time period from 1993-2002 was only 0.59%. Future studies should include information on prevalence rates in urban areas of Trinidad & Tobago, as UNAIDS did not include these numbers in their reports.

HNS – 12 NEW DIAGNOSTIC PROCEDURES FOR DETERMINANTS OF DRUG-INDUCED LUPUS

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Drug-induced lupus (DIL), occurs after patients begin a regimen of drugs used to treat hypertension, thyroid conditions, or heart disorders. The conditions caused by DIL are similar to systemic lupus erythematosus (SLE). It was determined that procainamide causes lupus by altering the reactivity of endogenous hydrogen peroxide, thus causing the denaturation of cellular proteins. A chemical reaction was studied using either procainamide or a control (water), and the same was done with an unknown and water, to test the effectivity of the assay as well as eliminate bias. The chemicals used were procainamide, hydrogen peroxide, a phosphate buffer, dithiobisnitrobenzoic acid (DTNB), ethylenediaminetetra acetic acid (EDTA), an unknown drug, and cysteine. The amount of absorbance of the previous stated chemicals reacting was observed, and ranged from 2.0 % absorbance to 0.0 % absorbance. It was recorded that the procainamide and unknown chemical (later revealed to be aspirin) had an increased reactivity then the control (water). When being compared to in vivo situations, the 0.05 % to the 0.00 % absorbance range translated to the start of the destruction of cells. Thus the purpose of this study was the development of a testing procedure to determine which chemicals cause DIL within humans.

HNS – 13 MODERN TREATMENTS FOR ACUTE MYELOID LEUKEMIA

Zujaja Tauqeer (HS) & Janice Baronowski, Brooklyn Technical High School, Brooklyn, NY

Acute Myeloid Leukemia has been subject to much scrutiny by medical researchers, and the approaches to fight it often vary. With so much emphasis on certain therapies, such as chemotherapy, patients often do not take the opportunity to consider other modern treatments. The data that can effectively compare those treatments is simply not available in concise form for patients. After conducting a comparative study using two clinical studies each for two treatments, allogeneic stem cell transplantation and targeted therapy using tyrosine kinase inhibitors, trial results were averaged to observe patterns concerning relapse, survival from remission, and disease/progression-free survival in patients of the respective studies. The non-invasive element of targeted therapy made it a good option for patients older than 55 years with fragile immune systems and intolerance for rigorous procedures such as allogeneic stem cell transplantation. Studying the difference between diagnosis periods and stages of the disease in various patients, the short term advantage was seen in allogeneic stem cell transplantation as patients who were in advanced stages and did not experience remission with drugs had a better chance of survival with this treatment. Targeted therapy, as observed with the tyrosine kinase inhibitor Gleevec (imatinid mesylate), was very effective in stopping progression of the disease in patients in early stages of Chronic Myeloid Leukemia. These differences in treatments according to patient history leads to the assumption that direct observation of patient groups is the next step in validating these findings.

HNS – 14 INCIDENCE AND MORTALITY RATES OF SKIN CANCER IN PEOPLE AGES 12 TO 24

Madeline D. Villaruz (HS) & Janice Baronowski, Brooklyn Technical High School Brooklyn, NY 11217

Basal Cell Carcinoma, the most common form of skin cancer, affects roughly 800,000 Americans each year. If it is not detected and treated early, the disease will cause considerable damage. There are several symptoms of this cancer and although having these warning signs does not guarantee a positive diagnosis, they should not be ignored. The rate of skin cancer is high within both the adult and younger populations. Incidence rates and mortality rates were analyzed in the American population. It was hypothesized that a gradual increase in these two rates would occur over a specific seven year period. Information was gathered from studies conducted from 1998 to 2005 and yearly rates were taken from the US Census Bureau. Utilizing other studies as well as fact sheets, the number of cases recorded was collected; incidence rates and mortality rates were calculated for each year. A notable trend was observed; there is an 18.65% increase in incidences and a 12.13% increase in mortality rates in both populations. America's youth are at high risk for developing skin cancer, with more and more adolescents being diagnosed and even dying from basal cell carcinoma each year. This significant increase in rates is alarming, in that if the trend continues, more people, overall, will suffer from this almost avoidable disease.

PEES - 1 MECHANICAL PROPERTIES OF BONE INFLUENCED BY A LOW ESTROGEN ENVIRONMENT IN PREPUBESCENT RATS

David S. Bones (UN) and Vanessa R. Yingling, Department of Physical Education & Exercise Science, Brooklyn College of CUNY, Brooklyn, NY 11210

Osteoporosis has been defined as a disease characterized by a low bone mass and deterioration of bone tissue which causes an increased risk of fracture. A major cause of osteoporosis is the lack of accumulated bone density before age 30. Less bone is available when bone begins to breakdown faster than it is formed. For young woman, building bone mass is critical in the prevention of osteoporosis. Estrogen is important to bone mass. It helps bones absorb the calcium they need to grow and resist fracture. The aim of this study is to show the relationship of low estrogen to the various mechanical properties of bone. Sprague-Dawley rats were placed into two groups, a control and experimental group. The rats in the experimental group were injected with GnRH antagonist which suppresses estrogen levels. The tibia and femur of both control and experimental rats were analyzed under conditions of applied mechanical stress and data was collected. From the data collected, there was a decrease in bone stiffness of the tibia (1.63%), but an even greater decline in bone stiffness of the femur (8.99%) of the rats. There was also a significant decrease (approx. 10-13%) in the moment of fracture of both the tibia and femur, and a decline in the energy required for bone fracture of both the tibia (32.56%) and the femur (27.37%). In summary, low estrogen results in a decrease of the various mechanical properties of bone.

PEES – 2 WHY DO YOU THINK LOW ESTROGEN WILL AFFECT THE MOMENT OF INERTIA?

Dashana Payne & **Melinda Vargas** (HS) & Vanessa R. Yingling, Department of Physical Education & Exercise Science, Brooklyn College of CUNY, Brooklyn, NY 11210

Osteoporosis is a disease in which bones become fragile and more likely to break. If not prevented or if left untreated, osteoporosis can progress painlessly until a bone breaks. These broken bones, also known as fractures, occur typically in the hip, spine, and wrist. The aim of this study was to investigate how low estrogen levels affect the moment of inertia of femoral cross-section. The moment of inertia is describes how the material is distributed with respect to a specified reference axis called the neutral axis. A region of material that is greater distance from the neutral axis is much more efficient in resisting bending about that axis than a region of material coincident with it. In the experiment we used female rats. Some were injected with gonadotropin-a releasing hormone antagonist (GnRH-a). Two controls were used Low estrogen vs. normal. After the test the rat's bones were processed onto slides and reviewed. The conclusion was the low estrogen might decrease the moment of inertia. The question to be answered is why is the moment of inertia important.

ENV – 1 ENVIRONMENTAL DISCREPANCIES IN DEVELOPING COUNTRIES

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We are examining the Environmental Performance Index with an emphasis on developing with the emphasis on: Egypt, Kenya, Nigeria and Syria. These countries are ranked low in the index and our hypothesis is the low ranking originates mostly from poverty and not due to the environmental neglect. The data we researched came from sources such as World Bank and British Petroleum. Our data will normalize to the worst value for Iceland, Switzerland, Columbia, Russia, United States and Kazahkstan. The environmental indicates child mortality, drinking water, etc...
Our conclusion is that the scale should change to reflect the effect of poverties on the countries.

ENV – 2 CHALLENGES TO THE ENVIRONMENTAL PERFORMANCE INDEXES (EPI) FOCUSED ON FINLAND, ITALY, AND POLAND

Joanna Barbera (UN) Denise Banfield, Lisa Deremer, Anabel Rodriguez, Anna Svirskaia & Micha Tomkiewicz, Department of Environmental Studies, Brooklyn College-CUNY, Brooklyn, NY

The purpose of our research was to observe and analyze how the environmental factors affected the development of European countries. We focused our research on Finland, Italy, Poland as referenced to the United States and India. The factors critically are critically analyzed: urban particulates, regional ozone, nitrogen loading, water consumption, timber harvest rate, energy efficiency, renewable energy, carbon dioxide per gross domestic product, participation in international environment agreement, and environmental governments.

We have gathered our information using the Environmental Performance Indexes (EPI) of 2006 as well as Environmental Sustainable Indexes of 2005. We have agreed to focus on Air pollution as our main topic. We have gathered our information using the Environmental Performance Indexes (EPI) of 2006 as well as Environmental Sustainable Indexes of 2005. We have agreed to focus on Air pollution as our main topic. Our challenge was to create our own EPI index based on the information we have found. This research has led us to believe that the environmental factors listed above influence the overall environmental performances of European countries. Air Pollution is the result of burning fuels for energy. Three main air pollutants are sulfur dioxide, nitrogen dioxides, and carbon dioxide. Power and manufacturing plants contribute to Finnish air pollution. Emissions from these plants can cause acid rain. Over the years the Finnish Government has taken steps to prevent air pollution by passing laws and participating in treaties. Reductions in the emissions of these pollutants have caused air pollution to become less of a threat to the people of Finland.

ENV – 3 EVALUATING ENVIRONMENTAL AND GENETIC FACTORS OF MYOPIA

Leong F. Brian (HS) & Janice Baronowski, Brooklyn Technical High School, Brooklyn, NY

The purpose of this research was to evaluate the environmental risk factors that might be associated with myopia. Environmental and genetic factors were tested using 1-page surveys that asked questions about the time spent on nearwork and whether or not their parents were myopic. After analyzing the data using a smooth plot regression analysis, the data supported the genetic theory of myopia. Using a statistical program called SYSTAT, there was a strong correlation between the number of myopic parents and the right eye diopter value of the student. Based on the results no correlation could be made between nearwork and level of myopia.

ENV – 4 SOLID WASTE MANGEMENT PROBLEM IN THE CARIBEEN ISLAND OF HAITI.

Nixon Conserve (UN) & Micha Tomkiewicz, Environmental Studies, Brooklyn College-CUNY, Brooklyn, NY 11210

The goal of this project is to show some of the dangerous conditions that exist in Haiti in the absence of proper waste management policies and of proper enforcement methods. The actual condition in three specific areas will be presented. We will show that waste disposal practices do not exist. Trying to understand the causes of this major problem are complicated because the issues involve are intertwined with the absence of a functional government. These issues include the lack of education, low participation in the waste management program by the inhabitants, and financial mismanagement by government officials. We will present supporting data that emphasizes these findings.

ENV - 5 EFFECTS OF PH ON THE SURVIVAL OF TRIOPS

Slav Doroshev (HS) & **Julian Shnayder** (HS) & Barrington A. Harvey, Sr., James Madison High School, Brooklyn, NY

The Triops Longicaudatus is an extremely unique creature. Triops Longicaudatus are crustations that are also called Dinosaur shrimp or Tadpole shrimp that look like miniature horseshoe crabs. They have a short life cycle of 20-90 days- growing very quickly in this time to about 2 inches in length. Fossils of Triops have been found that show they were on the earth around 200 million years BC. The unusual thing is that Triops haven't really changed in all those years. Triops survived because their eggs exist in a state of suspended animation until they are added to water, scientists think that this is what helped the Triops survive the extreme temperatures and long droughts that existed at the time. The eggs will remain in a state of diapause for up to 25 years at a time.

This project explores the survival of these living fossils under several environments with varying pH levels. During my experiment, we cultivated a colony of Twelve Triops up until the adult stage of their life. After which we placed two in each of the six tanks we prepared earlier, one being the control, and watched what happened. The main idea of our experiment is to see what environment they thrive in the best, it being acidic or extremely alkaline. We base my observations on their behavior, the Triops are very active creatures who intake oxygen from the water by means of their feet, so in order to breath they must be constantly moving, we hypothesize that if their living habits or their environment is affected in any way, it will affect their chances of survival.

ENV – 6 THE IMPACT OF SEWAGE POLLUTION ON THE BIODIVERSITY OF TOBAGO

Derick S. Grant (UN) & Micha Tomkiewicz, Department of Environmental Science, Brooklyn College-CUNY, Brooklyn, NY

Although global warming has its effects on the coral reefs it is equally important to recognize the impact of sewage pollution on the biodiversity. The goal of this research is to investigate the effects on the islands vast natural underwater habitats and water quality. A two week study was done to identify the sources of sewage pollution as well as to research the effects of sewage pollution on the biodiversity of the reef.
The methods used included:

1) An interview with Ms. Celia Arthur of Crusoe Reef Society.
2) Guided tours and observation of water ways in close proximity to Buccoo Bay.
3) Scuba diving and digital video monitoring of the benthic reef communities to identify and quantify the composition of the reef.
4) A study of a bacteriological study done as well as the ultra-low concentration of water column dissolved inorganic nitrogen (D.I.N.)

From the information gathered one can conclude that sewage pollution is adversely affecting the biodiversity of Buccoo Reef.
Will Tobagonians lose one of their main tourist attractions and a source of income?

ENV – 7 CHALLENGING THE EPI ENVIROMENT PERFORMANCE INDEX FROM THE YALE REPORT

Jenaira Torres (UN), **Craig Folkes** (UN), Burcu Aydogdu , Aizhen Li, Sophia Chen & Micha Tomkiewicz, Department of Environmental Science, Brooklyn College-CUNY, Brooklyn, NY

The goal of this project is to challenge the EPI from the Yale report. Our group concentrates on Asia focusing on Japan, China, and Indonesia. Both China and Indonesia are developing countries whereas Japan is a developed country. This constitutes the average score for the three countries to be lower than it actually is. After reviewing the index, we found that many of the indicators used to create the report are not clear and accurate. We researched other reports from governmental websites and found that there were discrepancies, which caused our ranking in the Yale report to be substantially lower than it should have been. For example, renewable energy is limited to Hydropower and does not take into consideration the broad range of sources of renewable energy. We believe one of the reasons for the inaccuracies in the scale is that it was formulated by an industrialized country. The industrialized countries lower the ranking of developing and underdeveloped countries.

ENV – 8 GLOBAL ENVIRONMENTAL INJUSTICE

Erika D. Harvey (UN) & Micha Tomkiewicz, Environmental Studies Program, Brooklyn College-CUNY, Brooklyn, NY 11210

In recent years waste management has become increasingly important as populations grow and space is becoming a scarce commodity. Many developed countries have decided to recycle their waste and in many cases exporting it abroad to developing nations. This paper will investigate some of the consequences of this practice; exporting waste as a form of recycling from developed nations to third world countries, the effects on the populations and environments that receive these recycled materials and who benefits. The research will focus specifically on waste exported to Nigeria, Haiti, Asia and India from the United States and Europe.

ENV 9 - THE EFFECTS OF THE RADIOACTIVE POLLUTION ON THE NATURAL ECOSYSTEMS IN THE CHERNOBYL EXCLUSION ZONE

Lina Lukina (UN) & Micha Tomkievicz, Department of Environmental Studies, Brooklyn College-CUNY, Brooklyn, NY 11210

The explosion of the Chernobyl nuclear power plant in 1986 resulted in severe radioactive contamination of the adjacent territories. A 30 km human evacuation zone was established that constitutes a unique open-air laboratory for radiobiological research. The purpose of this work is to follow the changes in the biota of the zone, based on the results of the studies that were reported since the accident. Exposure to high levels of ionizing radiation has adverse effects on living organisms, and the radioactive contamination of the Chernobyl region was expected to be damaging to its wildlife. The results, though, are somewhat surprising. During the first couple of months following the explosion, negative effects were observed in terms of increased mortality

and reproductive losses in coniferous plants, soils invertebrates and mammals in the contaminated areas. But after the first couple of years the ecosystems started to show significant signs of recovery. The diversity and abundance of many species is now similar, and sometimes exceeds those of the control regions. Some 100 threatened species, not previously seen in the zone, are now thriving in the area. Apparently, the net ecological effect has been positive. The recovery of the affected biota followed the natural reduction of exposure levels and migration, but the main variable, responsible for the flourishing of the natural ecosystems, is the removal of human activities and the subsequent creation of a wildlife preserve.

ENV – 10 TRAFFIC VOLUMES AND PATTERNS

Saad Naeem (HS), Ali Afshar & Alan Stack, Polytechnic University & Steven Kaye, Midwood High School, Brooklyn, NY

When thinking of the many problems facing our planet today, traffic would never come to mind. But because of the recent rise in consumerism, automobiles are becoming increasingly affordable. Therefore traffic volume has increased tremendously over the past few decades and along with it the negative effects of having so many cars on the road. Not a day goes by when we don't hear on Good Morning New York that the Lincoln tunnel is backed up for an hour or that there is a 30 minute delay on the Brooklyn Bridge. The recent overcrowding of the highways and roads is the direct result of the rise in traffic volume. Traffic jams further result in a waste of energy in the form of oil, not to mention the harmful emissions that are released into the atmosphere. It is our job to find a way to limit these negative effects. We study traffic patterns and attempt to determine not only where the traffic volume is the highest but what causes it to be so high. Then after that, we try to come up with possible ways to reduce the number of cars on a road at a particular time. As a result, we decrease the harmful results of traffic jams and indirectly prevent many accidents as well.

ENV – 11 EFFECTS OF MOLD EXPOSURE ON FLOOD-RELATED VICTIMS

Jeff Palmere (HS) & Janice Baranowski, Brooklyn Technical High School, Brooklyn, NY

Flooding causes mold formation in indoor environments to increase, making individuals more susceptible to illnesses that affect body systems including the respiratory and reproductive systems. The goal of this study is to determine the effects of flooding on mold formation, and the consequential health risks involved in mold-exposure. Information on mold-related symptoms, affected body systems, percentages of infected individuals, and comparisons between indoor and outdoor exposure was obtained through secondary sources. The study focuses on the individuals who have been exposed to mold at levels deemed hazardous by the World Health Organization and other health institutions. The most common symptoms between the varying individuals included fatigue, muscle pain, joint pain, and neurocognitive dysfunction. This study did no distinguish between any age group, gender, ethnic, or regional differences. The secondary data was obtained from individuals who were exposed to mold within the continental United States. In addition, the study concluded that the prevalence of illnesses among the mold-exposed individuals was due in part to the inefficient system of preventing exposure when individuals returned to flooded homes.

ENV – 12 CHANGING BRAZIL'S ENVIRONMENTAL STANDING IN THE ENVIRONMENTAL PERFORMANCE INDEX

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Our projects focus is to show the environmental issues facing Brazil and what effects they have on the Environmental Performance Index (EPI). The EPI focuses on two main Environmental Protection Objectives: 1). Reducing environmental Stresses on human health and 2) Protecting ecosystem vitality. In Brazil the factors affecting our EPI are drinking water, indoor air pollution, adequate sanitation, regional ozone, urban particulate, infant mortality rates, water consumption, timber harvest, agricultural subsidies, and wilderness protection. In the context of Brazil, we have modified the sustainable energy category to include biomass, that in Brazil constitute much more important factors than the Hydropower. We will also try to emphasize the interdependence of factors such as drinking water and adequate sanitation.

ENV – 13 CHALLENGES TO THE ENVIRONMENTAL PERFORMANCE INDEX: FOCUS ON DEVELOPED COUNTRIES

Rosemarie E. Costa (UN), Kelly A. Dowling, Zara N. Gray, Noriko Kitahira, Kimberly J. Ronallo & Micha Tomkiewicz, Department of Environmental Studies, Brooklyn College-CUNY, Brooklyn, NY

The purpose of this project is to establish our own environmental performance index using Yale's Environmental Performance Index as a guideline. Our emphasis is on the developed countries of the U.S.A., New Zealand, and Japan. We are evaluating the following environmental issues, Urban Particulates, Nitrogen Loading, Wilderness Protection, Timber Harvest, Overfishing, Consumption of Ozone depleting Substances, and CO2 Emissions. We are also including the participation of these countries in environmental treaties and the quality of governance (issues that are not included in the EPI). After assigning each of these categories a weight, we use the data to determine each country's placement inn our own environmental performance index.

ENV – 14 WHAT IS THE EFFECT OF MUSIC ON PLANT GROWTH?

Barbara A. Rodriguez (HS) & Francis Fisher, Franklin Delano Roosevelt High School, Brooklyn, NY 11224

The goal of this study is to figure out if music would have any effect on plant growth. The idea was to see if the concept of music effecting plants was absurd or credible. The researcher's hypothesis had been that the music was not going to affect the plant growth. She put one pair of the same species plants to be used as the experimental variables. She also used another pair of the same species plants to be used as the controls. The experimental variables were placed in a room with a small stereo playing a mix of music. The researcher believed if she used a mix of music, that the experiment would be more effective. The controls were placed in a different room with no music at all. From then on, she recorded the daily results of each plant.

During the first week of the experiment the researcher found that the plants had grown at a very similar rate. At the end of three weeks the results for the variables turned out to be a 42% average rate of growth and 43% for the controls. Also according to Ross E. Koning of the Plant Physiology Information Website, plants have no brains or ears to develop or process musical appreciation. Therefore from what she conducted and from her research she found that music had no affect.

ENV-15 THE EFFECTS OF GLOBAL WARMING ON THE CARIBBEAN

Michele Ruiz (UN), Evelyn Nunez, Julissa Fabre, Jacqueline B. Haynes, Cyslin Pajares, Simone Elias & Micha Tomkiewicz, Department of Environmental Studies, Brooklyn College-CUNY, Brooklyn, NY

The Environmental Performance Index (EPI) of 2006 lists certain environmental indicators that affect every country worldwide. We have used some of these indicators to focus on exactly how global warming affects four Caribbean countries: Trinidad and Tobago, Cuba, Haiti and the Dominican Republic. Global warming is the increase of the temperatures of Earth's atmosphere and oceans due to large amounts of carbon dioxide and other chemicals released into the environment, causing a stronger greenhouse effect. In this project, we will not only present the effects global warming has on each of these countries, we will also discuss what the governments are doing to correct the problems.

ENV – 16 AGRICULTURAL DRAINAGE AROUND THE WORLD

Priscilla Yuen (UN) & Micha Tomkiewicz, Department of Environmental Studies, Brooklyn College-CUNY, Brooklyn, NY

Agricultural drainage refers to the use of ditches and underground pipes to remove excess water from lands that don't drain well. During the early 1800s, ditches were widely used to carry water from their farms to nearby water sources. Underground piping is used more widely now in place of those ditches to drain the saturated soil. When an underground drainage system is installed, the pipes are either tactically placed to drain selected areas, or placed in a pattern to drain the entire field. Waterlogged terrains do not allow proper ventilation for growing roots. By draining these terrains, much more of the soil can be utilized by plant roots. For many regions of the world, without agricultural drainage the land is not suitable for crop growth. The goal of this project is to study the different drainage systems used worldwide. Regions being studied in this project include: the Imperial and San Joaquin Valleys, JiangXi, Egypt, British Columbia, as well as Great Britain. By studying the different drainage systems used worldwide, we can determine which system is most effective and which is least effective.

ENV – 17 BIODEGRADABLE PLASTIC

Vyacheslav Sobkov (HS) & Barrington A. Harvey, Sr., James Madison High School, Brooklyn, NY

Environmental conservation is currently an aspect of great importance for large sectors of human society and for the international scientific community. Among the numerous environmental problems faced by urban centers, it is possible to point to the large amount of plastic waste, originally produced the petrochemical industries, which is accumulating at waste disposal sites due to degradation difficulties. Plastics play a very important role in our society, but they create too much pollution and harm living organisms. So a new way of making plastics must be found, it is to make biodegradable plastics. Plastics used right now take up to 500 years to break down and plastics dumped into the ocean kill as many as 1,000,000 sea creatures every year.

This project explores an unorthodox substitute for the former plastic, which would be biodegradable. This plastic is made all the time by bacteria and the supply is limiless. The polymer is called polyhydoxybutyrate (PHB). To make PHB on a large scale you must fatten bacteria with glucose in giant fermenters and effectively make the plastic. The time it takes for PHB to degrade could be just a few weeks.

PHYSICS 1 – WHAT ARE THE PARTICULAR QUALITIES IF MECHANICAL AND ELECTROMAGNETIC WAVES

Yelena Ginzburg, Miroslav Shubernetskiy (HS), & Steven Kaye, Barrington Harvey, James Madison High School, Brooklyn, NY11229

Waves have few common characteristics. Those characteristics are:
The medium through which the wave is traveling affects the speed of the wave 2) Interference 3) Refraction 4) Reflection 5) Diffraction. In order to prove that wave speed changes in different media we conducted a series of experiments by measuring the speed of sound waves in different media such as alcohol, water, salt water and glycerin. We found out that in denser medium like glycerin the speed of wave was slower; however in a less dense medium like alcohol waves traveled faster. It was concluded that the media through which waves travel affects the speed of the waves. We were interested in determining the affects of different media on the speed of electromagnetic waves. We used some sources of electromagnetic radiation like microwave oven, cordless telephone and radio in order to observe the behavior of electromagnetic waves. We discovered that there was interference between three sources of radiation, which were a microwave oven, a radio and a cordless telephone.

CIS – 1 IMPLEMENTING GAME SIMULATIONS ACROSS A DISTRIBUTED NETWORK USING A FUNCTIONAL LANGUAGE

Murray Gross and **Mark Velez** (UN), Department of Computer Information Science, Brooklyn College-CUNY, Brooklyn, NY 11210

At the core of all games are simulations that often require a great deal of processing and computation. This aspect of games appeals to parallel or distributed programming. Yet, sophisticated games often can be simulated assuming only an embarrassingly parallel algorithm. Currently popular programming languages, libraries and paradigms often do not satisfy the requirements of the problems within these games. We present a distributed, functional system that attempts to resolve these issues.

The functional paradigm provides programmer assistance and a reduction in debugging and verification efforts. Our distributed, self-optimizing functional system provides a working example of an effective environment that gives a working solution to game programmers. Tic-tac-toe, while thoroughly analyzed in 2-dimensions, gives a model that is simple enough to expose the effectiveness of the approach, and, in multiple dimensions, is a challenging enough problem to provide valid results on the parallel/distributed implementation.

We implement multiple versions of tic-tac-toe with increasing computational demand and analyze the efficiency of the self-optimizing functional system that distributed Haskell provides. We also analyze the algorithmic differences, benefits, and disadvantages that our environment provides in comparison to currently popular languages and paradigms. We demonstrate that our environment is a viable solution to the problems that highly-computational, IO dependent simulations face and provide statistical evidence for game theory.

CHEM - 1 BIOMIMETIC SYNTHESIS OF NATURAL PRODUCT TOXIN POLYSULFANES

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Benzopolysulfanes are a class of compounds isolated from marine invertebrates, which have a dopamine core and a pentasulfur linkage. These compounds possess cytotoxicity, antifungal activity, and other biological activities. Although these compounds have been isolated, the biosynthetic origin and mechanism for introduction of sulfur atoms into dopamine has not been examined. We propose that natural product benzopentasulfanes arise biosynthetically by the reaction of dopamine-*o*-quinone and elemental sulfur dianion, S_x^{2-}. The viability of this proposal was examined by the biomimetic study of pentathiabenzocycloheptene-1,2-diol using a new *o*-benzoquinone—S_x^{2-} reaction. The work with catechol serves as a model for dopamine, and provides a method for the synthesis of catechol-polysulfur bonds. A mechanism for the formation of pentathiabenzocycloheptene-1,2-diol is suggested that invokes an intramolecular conversion of hydropolysulfidoquinone and an intermolecular equilibrium of bis-mercaptocatechol with elemental sulfur S_x

CHEM – 2 SYNTHESIS AND CHARACTERIZATION OF A RUTHENIUM COMPLEX OF ISONIAZID

Bola Aladegbami (UN) & Roberto A. Sanchez-Delgado, Department of Chemistry, Brooklyn College-CUNY, Brooklyn, NY 11210

Tuberculosis [TB] afflicts 1/3 of the world's population. Isoniazid (INH, isonicotinic acid hydrazide) is one of the most important drugs used in the treatment of TB but widespread resistance has led to loss of its efficacy. Metal complexes can be effective drugs, as shown by the success of the anti-cancer agent cisplatin and can help overcome resistance, as in the case of Ru-chloroquine complexes that are active against resistant strains of malaria parasites. The object of this project is the synthesis of ruthenium-INH complexes with enhanced activity against tuberculosis. The first complex of this series, "$[Ru(INH)_2C1_2]$.THF" has been prepared by reduction of $RuC1_3.3H_2O$ with Zn dust in THF, followed by addition of INH under relatively mild conditions. The complex has been characterized by FTIR, UV-vis, ^1H and ^{13}C NMR and conductivity measurements. The structure most likely consists of 2 chelating INH ligands bonded to the Ru^{e+} ion through the carbonyl and the terminal $-NH_2$ groups, and two chloride ligands that are rapidly exchanged by solvent molecules in aqueous solution.

CHEM – 3 PHYSICAL AND BEHAVIORAL EFFECTS OF SALVIA DIVINORUM

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Native Americans of the Oxican region in Mexico have used Salvia divinorum for 2000 years. Salvia d. is a member of the mint family and a very close relative of household spice "sage". The plant material is unscheduled in the United States and remains legal to grow or posses and has gained much popularity from underground culture seeking a legal "high". The recent analysis of this plant has found the active substance Salvinorin A. that is deemed to be more potent than LSD and is reported to cause strong hallucinations.

The chemical is structurally not assumed to be active. It is not an alkaloid because it lacks a nitrite. Although it obviously has been shown to have very prominent effects on both the body and mind. It has recently been analyzed it to determine why consumption this non-alkaloid substance results in such prominent responses. The active site of the "Kappa Opioid Receptor" out of more than the 50 active sites studied only the Kappa Opioid was stimulated.

Research was conducted on gold fish and Daphnia *magna*: testing their physiological and behavioral responses that occurred upon administration of Salvia D to the test subject's environment (water) at different concentrations. Experimentation is ongoing

CHEM – 4 SYNTHESIS OF RU-CHLOROQUINE COMPLEXES AND EVALUATION OF THEIR HEME AGGREGATION INHIBITION AND DNA BINDING PROPERTIES.

Chandima Rajapakse, **Cula Dautriche** (UN) & Roberto A. Sanchez-Delgado, Chemistry Department, Brooklyn College-CUNY, Brooklyn, NY 11210

Malaria is among the most infectious diseases causing over two millions deaths annually. Chloroquine (CQ) is the most widely used treatment for the disease; however, emergence of resistance results in its inefficiency. Complexation of CQ to metals has been previously shown to enhance the activity against resistant strains of the parasite (Plasmodium falciparum). The object of this project is to prepare new arene-Ru-chloroquine complexes as potential anti-malarial agents. [(Ru-p-cymene)(Sov)2CQ]2+2BF4- was prepared by reacting [RuCl2(p-cymene)]2 with AgBF4 in acetone, followed by the addition of CQ. A second complex [(Ru-p-cymene)(CQDP)]2+2PF6 (CQPD=chloroquine diphosphate) was prepared by reacting [RuCl2(p-cymene)]2 with AgPF6 and CQDP in water at 55oC. Both complexes were characterized using 1H and 13C NMR spectroscopy. The anti-malarial potential of the new complexes is being investigated by heme aggregation inhibition assays and DNA melting experiments.

CHEM – 5 NATURAL MACROCYCLE MOLECULES HAVE A LIMITED STRUCTURAL DIVERSITY

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To explore the possibility that constraints in ring sizes may provide a clue to a general method by which nature constructs cyclic molecules, we undertook an examination of natural products which have been reported to date. A periodicity was observed, which is new and significant. This paper presents statistical evidence that natural molecules containing 14-, 16-, and 18-membered rings are of unusually frequent occurrence. The results raise a question concerning the limited diversity of macrocycle ring sizes and the nature of the constraints that may cause them.

CHEM – 6 THEORETICAL STUDY OF THE REACTION PATH OF SINGLET OXYGEN WITH INDIGO DYES

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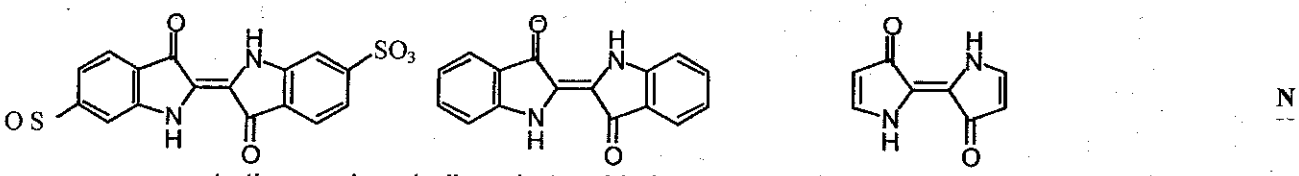
The reaction of singlet oxygen ($^1O_2$) with indigo carmine (1), indigo (2), 1H,1'H-[2,2']-bipyrrolylidene-3,3'-dione (3), and vinyl amine (4) was conducted computationally to



compare to the previous indigo photooxidation studies of Kuramoto et al.(Kuramoto, N.; Kitao, T. 1 *Soc. Dyers Colourists* **1979,** *95, 257).* Computations were used to investigate the mechanism of oxidative cleavage of the carbon-carbon double bond of **1-4** by singlet oxygen in terms of relative transition state barriers. Density functional theory calculations aided in explaining the contributions of the [2+2] vs heteroatom-ene pathways in this reaction, which will be discussed.

CHEM – 7 NUTRITION AND VEGATATIVE REPRODUCTION

Mohammed Hosen (HS) & Frances Fisher, Franklin D. Roosevelt High School, Brooklyn, NY

The experiment that I am conducting deals with four major aspects and how they intertwine and depend on each other. First of all, I will start by telling you about the three nutrients in this experiment. They are Nitrogen, Potassium, and Phosphorus. Nitrogen is a nonmetallic chemical element. It occurs in nature as a colorless, odorless, and tasteless gas. This gas makes up about 78 percent of the earth's atmosphere by volume. Nitrogen gas consists of two nitrogen atoms bonded together to form a molecule. Almost all fertilizers contain nitrogen, which is necessary for the healthy growth of plants. Farmers may inject ammonia gas directly into the soil. Liquefied ammonia and such compounds as ammonium sulfate and ammonium nitrate also are used as nitrogen fertilizers. Farmers can also supply nitrogen to their fields by rotating crops. In crop rotation, a farmer plants a field one year with corn, wheat, or some other crop that removes nitrogen from the soil. The next year, the farmer plants the field with legumes that restore nitrogen to the soil. Potassium is a relatively abundant element and makes up nearly 2 1/2 percent of Earth's crust. Scientists have developed a wide variety of uses for potassium and its compounds. Potassium metal, used chiefly in sodium-potassium alloys, is usually obtained from molten potassium chloride through a special chemical process. These alloys, which are liquids at room temperature, are used in the heat-transfer systems of some types of nuclear reactors called fast breeders. Plants require potassium for growth. Therefore, soil must contain potassium compounds to produce crops of high quality and yield. Potassium chloride is widely used in commercial fertilizers for most crops. But potassium sulfate is a better fertilizer for tobacco and crops that would be harmed by chloride.
Phosphorus is a nonmetallic chemical element. It is found in every living cell and has many industrial uses. In nature, phosphorus occurs only in compounds called phosphates. Plants and animals need phosphorus to live, as well as for normal growth.

Plants absorb phosphorus from soil and use it in photosynthesis. Duckweed is the name of several species of tiny plants that float on pools and ponds. Duckweed has no ordinary stem or true leaves. It consists of a flat green structure, usually with a single hair like root underneath. The common duckweed is the smallest flowering plant known. It measures only 1/16 to 3/16 inch (1.6 to 4.8 millimeters) long. Duckweeds are sometimes grown as food for ducks and fish.
For this experiment, I will combine duckweed with Nitrogen, Phosphorus and Potassium. This will be done to see which of those nutrients proves to work the best on that plant. So, we will see which nutrient is the best for the plants and that means which nutrient is essentially best for life on Earth.

CHEM – 8 CHARACTERIZATION OF THE S315I MUTANT OF MYCOBACTERIUM TUBERCULOSIS CATALASE-PEROXIDASE KATG

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Catalase-peroxidase (KatG) from *Mycobacterium tuberculosis* (Mtb) is responsible for the activation of the drug isonicotinic acid hydrazide (INH), a first line antibiotic for the treatment of tuberculosis. The mutation in the residue 315 is found in most clinical isolates and is important in INH resistance. To prove the reason for drug resistance in Mtb, a single amino acid mutation (S315I) was constructed by site-directed mutagenesis. The activity of the purified enzyme was characterized spectrophotometrically by the formation of IN-NAD (isonicotinoyl-NAD adduct) in a reaction mixture containing KatG, Isoniazid (INH), and adenine dinucleotide cofactor in the absence of InhA. Catalase and peroxidase activity measured using t-butylhydroperoxide and odianisidine was moderately reduced in the mutant compared with wild type (WT) KatG. These observations reveal that although KatG (S315I) maintains reasonably a steady state compared to WT KatG, poor binding of the drug to mechanisms of action.
enzyme could limit drug activation and brings about INH resistance.

CHEM - 9 SYNTHESIS AND CHARACTERIZATION OF A NOVEL RUTHENIUM (II)-CHLOROQUINE COMPLEX WITH POTENTIAL ANTITUMOR PROPERTIES

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The success of cisplatin and related platinum complexes as anticancer agents has stimulated the search for other transition metal complexes with similar activity. In particular, ruthenium has attracted recent attention due to its reduced toxicity relative to platinum, and the ease of its delivery into cancer cells through binding to the heme sites of the proteins lactoferrin and transferrin. In view of this, we have synthesized a novel Ru (II) complex of $[(\eta^6$–p-cymene)(CQ) $RuCl_2]$ (CQ = Chloroquine). The structure of the complex has been characterized by a combination of elemental analysis and $^1H/^{13}C$ NMR, UV-vis and IR spectroscopic methods. The compound has measurable solubility in water and is air-stable. Conductivity measurements show the complex to be electrically neutral in nonpolar solvents such as chloroform. In contrast, measurements in aqueous media show substantial conductivity due to the exchange of a chloride ligand with water to form an aqua complex of the form $[(\eta^6$–p-cymene)$RuCl(CQ)(H_2O]^+Cl^-$. We have yet to conduct in vitro cytotoxicity screening of our complex on tumor cell lines and

are exploring the interaction of our complex with DNA by thermal denaturation and isothermal titration microcalorimetry experiments in order to explore possible mechanisms of action.

CHEM – 10 ALTERATION OF CORTICAL REDOX STATE BY LACTATE

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Panic disorder is a serious and potentially incapacitating condition that affects 2% of the population. One of the hallmarks of a panic attack is increased levels of blood lactate in panic-prone patients-Pitts and McClure. While the underlying mechanism of how lactate induces panic is unknown, potential mechanisms such as redox can be studied. Therefore, we addressed whether lactate induces panic. To determine whether lactate induces panic, protein extract were prepared, and the cortical redox (NAD+/NADH) was assayed. To determine [NAD]total in each lactate and saline extract, 30ul of the each extract was added to 475µl of NAD cycling buffer. To initiate the reaction, 501.tl of 6M EtOH was added and the spectrophotometric changes at 570nm were monitored for 2 minutes at 10-second intervals. An aliquot of the cortex extract was heated for 30min at 60°C. 301.tl of this heated sample was then assayed for NADH as described above. The reaction is termed a cycling reaction since NADH is reduced and NAD+ is oxidized by the enzyme Lactate dehydrogenase to pyuvate. The rates observed in the cycling reaction represent the NADH and the NAD+ concentrations. [NAD+] was calculated by subtracting the reduced valve from the [NAD] total. The BCA assay was then used to standardize the different concentrations of cortex used. We have anticipating results that lactate contributes to the change in NAD+/NADH ratio. Lactate is accepted to be different from pyuvate and saline because of the alteration of redox state. We need to study the affects of lactate for better drug development.

CHEM – 11 ISOLATION AND PURIFICATION OF MONOCLONAL ANTIBODY 3C4

April Pruski (HS), Midwood High School, Brooklyn, NY 11210; Dr. Josef Michl, SUNY Downstate Medical Center, Brooklyn, NY 11203

3C4 hybridoma cells were cultured in MaxICell Hybridoma-medium with Fetal Bovine Serum (FBS). The 3C4 hybridoma cells secrete mAb 3C4, and the spent supernatant was collected to extract the mAb3C4 immunoglobulin (IgG) protein. The spent medium was centrifuged at 3000xg to remove all cell fragments. The spun supernatant was then slowly mixed with saturated ammonium sulfate [$(NH_4)_2SO_4$] to reach 50% $(NH_4)_2SO_4$ saturation when IgG and a few other serum proteins become insoluble and form a precipitate that was obtained by centrifugation (3000xg). The precipitate was dissolved in phosphate buffer (PBS) and dialyzed against PBS for 100,000x its volume to remove any traces of the $(NH_4)_2SO_4$. The dialyzed supernatant was then pumped through a Protein G Sepharose 4 Fast Flow column, so that the Protein G adsorbed the IgG by binding to the Fc part (Fragment of the Constant region). After washing off all non-bound proteins bound IgG was released with 0.1 M glycine buffer, and the protein concentration was measured by reading the OD at 280/260nm. To identify that the released protein was IgG, the proteins in each fraction were separated according to their molecular

weight (MW) in a 12% TRIS-HCl sodium docecylsulfate polyacrylamide (SDS-PAGE) gel. IgG was identified as a 160,000 Da polypeptide using standard MW marker proteins and by reduction of the protein to the 26,000 Da light chain and 55,000 Da heavy chain. That mAb3C4 IgG was isolated was shown by its binding to its specific antigen, the PaCa-Ag1 on pancreatic carcinoma cells.

CHEM 12 - THE GENERATION OF UNUSUAL ORGANIC PEROXIDES REFERRED TO AS MONO- AND BIS-DIOXIRANES

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Biacetyl reacts with oxone to give bis-dioxirane [3,3'-dimethyl-(3,3')bidioxirane, **3B**] and mono-dioxirane [1-(3-methyl-dioxiran-3-yl)-ethanone, **3A**)]. Bis-dioxirane **3B** is formed when two oxygens are incorporated into biacetyl, while mono-dioxirane **3A** incorporated only one. A greater stability is observed in **3B** compared to **3A**, which is attributed to an □-dioxiranyl (anomeric) effect in the former. In contrast, **3A** suffers from a destabilizing □-electron withdrawing effect from the adjacent carbonyl group.

CHEM – 13 QUINOLINE HYDROGENATION BY RUTHENIUM NANO-PARTICLES SUPPORTED ON POLYVINYLPIRIDINE

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There is a great interest in high-performance catalysts for the hydrogenation of N-heteroaromatic compounds, as a possible means of eliminating nitrogen pollutants from transportation fuels. This is very important because these compounds form Nitrogen Oxide which is very dangerous to the environment. We have prepared a new catalyst by reduction of $RuCl_3.3H_20$ by $NaBH_4$ in methanol in the presence of polyvinylpyridine (PVPy). This results in a material composed of Ru nano-particles immobilized in the polymer, which after pre-treatment with H_2 at 120 °C and 20 atm, is capable of reducing quinoline exclusively to 1,2,3,4-tetrahydroquinoline in toluene solution under moderate reaction conditions. The catalytic tests were conducted in a high-pressure reactor fitted with a sampling valve; aliquots of the reaction mixture were withdrawn periodically and analyzed by gas chromatography. At 120 °C and 40 atm H_2 about 55 mole of quinoline is hydrogenated per mol catalyst per hour. The reaction rate is dependent on various reaction parameters like the temperature, hydrogen pressure and quinoline concentration.

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