



NewsLetter

The New Jersey Academy of Science

Kean University, Center for Science, Technology & Math Education

1000 Morris Ave. T-117, Union, NJ 07083

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NJAS ELECTIONS

Paul Bologna has been nominated for the position of **NJAS President-Elect**

Eric Iannacone has been nominated for the position of **NJAS Secretary**

A ballot is included with this NewsLetter. Ballots should be returned to: NJAS – Kean University, CSTME, Townsend Hall, T117, 1000 Morris Ave, Union, NJ 07083.

Ballots can also be emailed as an attachment to Dr. Laura Lorentzen at llorentzen@hotmail.com. Ballots are due by 15 July 2008

NJAS HAS THE FOLLOWING OPEN POSITIONS

Executive Secretary: Responsible for keeping the Executive Board aware of deadlines for varied activities of the Academy, as well as procedural deadlines for elections and similar functions.

Junior Academy Director: Work to oversee the high school student membership constituents of the NJAS, specifically to expand the membership base of participating high schools in the state in the many NJAS high school orientated initiatives like Science for Breakfast and Grant in Aid. The Jr Acad director will play a large role in the organization of the annual NJAS meeting.

Grant-In-Aid Chairperson: GIA chair handle the yearly Grant-in-Aid program that is funded by AAAS to accept science/math research proposals from high school students each fall that are reviewed by senior scientists. Highest-ranking proposals are awarded small funds to offset the cost of the student's research project. GIA chair works with the participating high school science/math sponsoring teachers to encourage all GIA participants to present their research at the annual NJAS meeting.

Program Development Coordinator: Works to keep NJAS activities up-to-date, and continuously advancing. Keeps abreast of programs sponsored or developed by other State Academies, the National Academy, educational organizations, and similar groups in order for the NJAS to engage in program partnership opportunities as they arise.

Science For Breakfast Coordinator: Once or twice a year the NJAS hosts a Science for Breakfast program for high school students in different areas throughout the State. The coordinator maintains contact with interested schools, arranges for scientist in various disciplines to be present for the event, coordinates advertisement of the event, maintains registration and similar activities which are required to host a successful event.

Web Manager: Web Manager: Maintains the NJAS official web page and makes changes to the site as requested by the Executive Board. Keeps the web site up-to-date and interesting for Academy members.

Nominations should be sent to Gail P. Carter, NJAS President at gcartographer@yahoo.com or to the NJAS directly at Kean University, CSTME, Townsend Hall, T117, 1000 Morris Ave, Union, NJ 07083

Volunteers should contact Gail P. Carter, NJAS President at gcartographer@yahoo.com or contact the NJAS at: 732-463-0511 or njacadsc@rci.rutgers.edu

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2008 ANNUAL MEETING

The following are the abstracts for the award-winning oral presentations given by members of the Junior Academy at the Annual Meeting

BOTANY

Anthony Chen, High Technology High School, Lincroft, NJ 07738.

“THE EFFECT OF LED GROW LIGHTS ON BUSH BEAN PLANTS”

LED plant lights yield many advantages over the customary fluorescent lights. The majorities of plant lights today are fluorescent or HID (high-intensity discharge lamps). LED plant lights are a lightweight, efficient alternative to these types of lights. Compared to fluorescent and HID lights, LED lights have low energy requirements. While fluorescent plant lights may use thirty watts, LED lights use about four to six. They can also be tuned to specific wavelengths that plant chlorophylls absorb, which

fall in the range of about 400 to 700nm. The question is whether there is a significant difference in the growth of plants grown with a fluorescent plant light compared to the same number of plants grown with an LED light. An experiment was set up that involved the construction of an apparatus which would accommodate plant growth with two different plant lights, with no interference between each other. Plant growth was defined as above surface biomass, measured in grams. When the data was collected and analyzed, it was found that there is no significant difference between the growths of the same number of plants under each type of light.

Joshua Ma, High Technology High School, Lincroft NJ 07738
“GRAVITROPISM VERSUS PHOTOTROPISM IN *Brassica rapa*”

It is known that plants grow against gravity and towards light, but results are unclear in the situation where growing against gravity would grow away from light. The objective of this study was to determine the degree of influence of light intensity on the direction of plant growth relative to the effects of gravity. The research hypothesis followed that there would be a significant difference between the changes in the angle of growth in plants grown over light sources of different intensities. To test this, Wisconsin Fast Plants (*Brassica rapa*) were suspended horizontally over a fluorescent lamp. The initial angle of the stems was measured with respect to the horizontal, and the plants were subjected to light intensities of 0 lux, 5500 lux, and 18000 lux for two hours. Afterwards, the final angle of the stem was measured in the same manner. The results from the ANOVA show a significant difference ($p = 2.586 \times 10^{-3}$, $\alpha = 0.05$) in the change in angle of plants exposed to different light intensities. After conducting three T-tests, the study supports the conclusion that higher light intensities will influence plants to grow against natural, negative geotropic responses while attempting to exhibit a stronger, positive phototropic response.

Harpreet Uppal, John F. Kennedy Memorial High School, Iselin, NJ 08830
“Ability of Certain Plants to Uptake Carbon Monoxide”

The purpose of this study was to determine which plant the Chinese Evergreen (*Aglaonema modestum*), Peace Lily (*Spathiphyllum*), the Spider Plant (*Chlorophytum comosum*), or the Dumb Cane (*Dieffenbachia amoena*) is capable of removing the most amount of carbon monoxide emitted from cigarette smoke. It was hypothesized that these plants would be capable of removing carbon monoxide because previous studies have shown them to be effective in removing benzene and formaldehyde-gases also found in cigarette smoke. This study has found that 200 ppm were released from just three cigarettes placed inside a chamber and a single house plant in that environment is capable of reducing carbon monoxide levels by as much as 50%. Leaf surface area measurements were then taken to calculate the biomass of each plant. Results from this

experiment suggest that the amount of carbon monoxide in a smoker’s home can be reduced for the benefit for non-smokers.

HUMAN OR ANIMAL BEHAVIOR

SESSION A

Brigit Carlson, High Technology High School, Lincroft, NJ 07738
“THE EFFECTS OF SPAWNING TANK SIZE ON THE AREA OF BUBBLE NEST CREATED BY MALE *Betta Splendens*.”

Bubble nests are blown by the male *Betta splendens* in anticipation of caring for eggs and eventually fry. *Betta splendens* need to breathe from the surface due to their labyrinth organ. Bubble nests keep the fry near the oxygen rich air above the tank. They also serve to keep the eggs moist and together. Bubble nests vary in size, and area. Most breeders are successful in breeding the fish using a 10-gallon tank. This experiment is being done to try and determine if tank size has any effect on the size of the bubble nest the male blows. The hypothesis was that there would be a significant difference in the size of the bubble nest blown by males placed in 5.5-gallon tanks vs. those blown by males placed in 10-gallon tanks. The male fish was placed in either a 5.5-gallon or 10-gallon tank that contained a female in a separate but visible container and was observed for a week. Data was collected each time a bubble nest was blown. An alpha of .05 was used in the analysis of the data. Based on the data analysis, one fails to support the research hypothesis and fails to reject the null.

Sanandeesh Kamat, John F. Kennedy Memorial High School – Iselin, NJ 08830.

“INVESTIGATION OF INTRANASAL DELIVERY OF hypocretin (*orexin*) A PEPTIDES ON LOCOMOTOR ACTIVITY AND FEEDING BEHAVIOR”

Narcolepsy is a sleep disorder characterized by a propensity for sleep attacks and cataleptic seizures. In addition, narcolepsy is accompanied by a marked loss of the orexin neuropeptides. Orexin A and B neurons have projections that extend into areas that regulate arousal, and hunger including the dorsal raphe nucleus, locus coeruleus, and ventral tegmental area. Researchers have connected the loss of orexin to narcolepsy but are challenged by a lack of an efficient route for delivering orexin. This research tested the intranasal (IN) delivery of orexin A by studying any induced alterations in activity (i.e.

locomotion) and food consumption. The four dosages used were 15 μ g, 30 μ g, and 75 μ g of orexin and saline (control). The results show that the 75 μ g dosage induced a significantly higher level of activity. However, the orexin groups displayed a significant and dose dependant decrease in food intake. These results indicate that the IN route is efficient enough to carry the orexin neuropeptide not simply to the brain, but more importantly in sufficient amounts for it to react with its receptors. Further studies must be conducted to assess whether the IN route can deliver orexin to areas of the brain specifically appropriate for the treatment of narcolepsy.

Anna McCabe, The Science Academy at Morristown High School, Morristown NJ 07960

“DETERMINING CANINE BREED SUCCESS IN ENTRANCE EVALUATIONS FOR ANIMAL ASSISTED THERAPY AND ACTIVITY CERTIFICATION”

Animal-Assisted Therapy is a means of using animals to interact with humans for a therapeutic use; while Animal-Assisted Activities are “meet and greet encounters” where humans interact with an animal for a few minutes. Golden Retrievers, Black and Yellow Labrador Retrievers, Shih-Tzus, and Cavalier King Charles Spaniels are the most popular canine breeds to undergo an entrance evaluation. The purpose of this investigation was to determine which breed was most successful in passing an entrance evaluation to become a certified animal assisted therapy and activities canine. This was done by analyzing and interpreting canine entrance evaluation records from St. Hubert’s Animal Welfare Center in Madison, NJ. It was determined that Golden Retrievers were the most popular breed to be evaluated and that the Yellow Labrador Retriever, Shih-Tzu, and Cavalier King Charles Spaniel breeds have the highest passing certification rate.

HUMAN OR ANIMAL BEHAVIOR **SESSION B**

Sruti Swaminathan, High Technology High School, Lincroft, NJ 07738

“THE EFFECT OF CELL PHONE AND BLUETOOTH DEVICES ON SIMULATED DRIVING PERFORMANCE”

This study compared the performance of 28 adolescent subjects on a driving simulation game under three conversational conditions, using cell phones, using Bluetooth equipped devices, and

conversation without use of either technology. The game was played using a steering wheel console and acceleration / brake pad foot input device. None of the subjects had prior experience with the input devices and only one had actual driving experience. Trials required each subject to complete one lap of the course. Both the time it took to complete a lap and the number of times the subject left the roadway were recorded. Significant differences in performance were noted among two of the three modes of driving conversations in terms of time (no device vs. cell phone and cell phone vs. Bluetooth [$\alpha=0.05$, p values <0.0004]). However, there was no significant difference between the no device and Bluetooth mode since the p value received was 0.066. Significant differences in performance were noted about all three modes of driving conversations in terms of crashes ($\alpha=0.05$, all p values <0.02).

Rima Patel, John F. Kennedy Memorial High School, Iselin, NJ 08830

“GLUCOSE AND SUSCEPTIBILITY TO FALSE MEMORY”

In states of false memory, people often become confused which leads to stressful arguments and problems. A recent unaccountable increase in the number of therapy cases involving false memories has gathered further interest in the topic (McDermott & Roediger, 1995). Individuals with high working memory capacities (WMCs) or high attentional control have fewer false memories than those with low WMCs (Bunting et. al., 2005). Thus, false memories occur primarily because of a lack of attention (Bunting et. al., 2005); one way to increase attention is through glucose consumption (Benton et. al., 1994). The present study investigated the question: will ingesting glucose reduce the amount of false memories in a forewarned sample of high school students? It was hypothesized that if students are both forewarned and ingest glucose, then they will reduce their false memories because these treatments, in combination, address both behavioral and physiological processes. The Deese-Roediger-McDermott (DRM) paradigm was used to illicit false memories in the subjects before and after the consumption of glucose. The numbers of false memories across the various conditions were tallied and an analysis of variance (ANOVA) was performed. ANOVA results indicated that glucose consumption reduces the number of false memories regardless of whether the subjects are forewarned.

David Kelly, High Technology High School, Lincroft, NJ 07738.

“COMPARING TWO METHODS FOR BLIND IDENTIFICATION OF U.S. PAPER CURRENCY”

This investigation studied two different methods of blind identification of U.S. paper currency, imprinting Braille and folding the currency, in order to identify which method was easier for novice subjects to use. Due to a lack of blind subjects, nineteen sighted subjects were gathered and asked to study a sheet with both stamped Braille patterns and the folding method diagrammed on it. They were given one day to learn both methods. On the next day, they were tested. Subjects inserted their hands into a box so they could not see what they were feeling and thus simulate blindness. Next, they were handed random denominations. They were continually handed denominations until they correctly identified three. If subjects got one wrong, the bill would be taken away and they would be handed a new one. The time it took to identify the denominations was recorded and added up to form a total time. The total time included the time for correct and incorrect identifications. The subjects were tested on two key points: how quickly they could identify three denominations correctly, and how many times they incorrectly identified a denomination in the process. Using a level of significance of 0.05, it was determined that there was a significant difference between the Braille vs. folding method in total time (p-value of 2.49×10^{-5}) and a significant difference in amount of incorrectly identified denominations (p-value of 8.09×10^{-4}). This data suggests that the folding method was much more accurate than the Braille for this group of sighted subjects.

HUMAN OR ANIMAL BEHAVIOR

SESSION C

Vipin Tyagi, Dickinson High School, Jersey City, NJ 07306

“SEARCHING FOR A TRADE-OFF BETWEEN REPRODUCTION AND STRESS RESISTANCE USING LITHIUM CHLORIDE TO INCREASE LIFESPAN IN CAENORHABDITIS ELEGANS”

The objective of this research was to search for a trade-off between reproduction and stress resistance when lithium chloride is used to induce longevity in the nematode *Caenorhabditis elegans*. It was hypothesized that a trade-off would occur when life span is increased. Three tests were conducted to

explore this hypothesis (life span assay, reproduction assay, and thermo tolerance stress test). Twenty-five worms from each group (lithium chloride and control) were used in a life span assay to determine whether or not lithium chloride treatments would increase life span. For the second test, total *C. elegans* progeny production for each group was recorded every 24 hours, starting on day 1 of adulthood, to assess for any differences in reproduction rate that may be due to increased life span, between the two groups. Lastly, a thermo tolerance stress test was conducted, and the survival rate of worms at 37°C was recorded for each group. Uncorrelated t-Tests showed that there was a significant increase in the life span of the worms that were treated with lithium chloride, a significant increase in stress resistance, and a significant decrease in the rate of reproduction, in comparison to the untreated worms. The results show that when lithium chloride is used to induce longevity in *C. elegans*, there is a negative relationship between fecundity (ability to reproduce) and life span extension, but a beneficial effect on stress resistance.

Kevin Lin High Technology High School, Lincroft NJ 07738

“THE EFFECT OF A COMPOSITION’S TUNING ON ITS APPEAL TO THE LISTENER”

The objective of this study was to find out if the general musical audience prefers musical compositions tuned to A = 440 Hz or musical compositions tuned to A = 444Hz. Musical performances are traditionally tuned to A = 440Hz. The hypothesis of this experiment was, “There is a significant difference between the number of people who find the music produced by the violin tuned to the A440 pitch more appealing than the number of people who find the music produced by the violin tuned to the A444 pitch more appealing.” During the testing sessions, subjects listened to the same musical composition twice on the CD, once tuned to A440 and then tuned to A444. The subject had to determine which composition he preferred, implying which pitch he preferred. The results indicate there was no statically significant difference (p = 0.31, = 0.05) when comparing the observed values to the expected values. The experiment failed to support the research hypothesis. It did not support the claim that there was a significant difference between the number of people who preferred music tuned to A440 and the number of people who preferred music tuned to A444.

Jessica Phan John F. Kennedy Memorial High School, Iselin, NJ 08830
“IMPACT OF THREE COLOR SCHEMES ON ACADEMIC PERFORMANCE”

The human reaction to color determines the color of legal pads used to write on and the color of advertisements in magazines. Elliot (2007) found a strong statistical relationship between color and human behavior. Previous studies in environments with different color schemes have shown that color has produced significant physiological and psychological responses, which can vary from high productivity and enhanced moods to low productivity and negative moods (Kwallek, 1990). The purpose of this study was to investigate the effect of color on academic test performance that may result from a physiological or psychological response to the color of paper on which the test was printed on—red, green, or white. If red tests provoke negative physiological and psychological responses among test subjects, than their test scores should be lower than a score achieved on white paper or on green paper which are thought to be neutral and calming colors. Students in the high school elective course, Anatomy and Physiology, were administered six successive tests with each student taking two of the six tests on each of the test colors. The data was statistically analyzed with an ANOVA and results indicate no significance between the red, green, and white. However, comparison of average scores shows that the novelty of the colors wear off after the first time each student takes a test on each color.

CELL / MOLECULAR BIOLOGY

Smriti Agrawal, John F. Kennedy Memorial High School, Iselin, NJ 08830.
“ANALYSIS OF A NON-CONTIGUOUS DNA SEQUENCE IN *Artemia Franciscana*”

Genome sequencing involved understanding the order of DNA nucleotides in a genome. By studying the gene sequences, Scientists can obtain beneficial information that is needed to analyze the growth, development, and survival of various organisms. However, a problem that is often encountered is that the whole genome can't be sequenced all at ones because available methods of DNA sequencing techniques can only handle relatively short stretches on DNA at a time. This results in broken pieces of DNA sequences that consist of a gap, or missing nucleotides in them. Therefore, the purpose of this project was to analyze a non-contiguous *Artemia*

Franciscana cDNA sequence, and understand the various ways in which the gap can be spanned using molecular biology techniques. The cDNA was found to code for a Soluble NSF Attachment Protein, which may play an important role in the insulin exocytotic process. Also, when a restriction map was created to find possible enzymes that can be used to sub-clone the cDNA, some of the results obtained were-HindIII, BsaJI, and BfuCI for the reverse sequence, and BsmAI, EarI, and PciI for the forward sequence. These results can help in forming a contiguous sequence through sub-cloning procedures in the future.

Avi Kapadia, Michael J Corcoran, Dickinson High School, Jersey City, NJ 07306.

“THE SIGNIFICANCE OF GENOTYPING TRANSGENIC MICE IN MELANOMA RESEARCH”

Melanoma is the deadliest form of skin cancer. The American Cancer Society estimates that more than 60,000 cases will be diagnosed and 8,000 deaths will occur due to melanoma, in 2007. Although surgical excisions successfully remove melanoma at earlier stages, melanoma does not respond to these therapies at later stages. Unlike past studies which have been done using only melanoma cell cultures, this study utilizes several transgenic mouse lines to study melanoma. Genotyping methods, such as a Polymerase Chain Reaction (PCR) are used to determine the genotype of the transgenic mice. Post analyses on these mice have shown that melanoma develops due to the expression of Metabotropic Glutamate Receptor 1 (Grm1). Grm1 is a G-Protein Coupled Receptor normally expressed and functional in the mammalian central nervous system. Grm1 inhibitors, such as Riluzole, have been successful in suppressing melanoma cell proliferation. The utilization of transgenic mouse lines have helped gain knowledge that would never have been gained otherwise. Transgenic mouse models serve as excellent model systems by which melanoma development can be better understood.

CHEMISTRY/BIOCHEMISTRY

Samir Ray , Dickinson High School, Jersey City, NJ 07306

“SHELF-LIFE EXTENSION AND MOISTURE CONTROL OF MULTI-DOMAIN AMARETTO COOKIES BY AN EDIBLE POLYMER COATING”

An ideal packaging material had traditionally employed on food manufactured from the food industry. Research in applying an edible packaging material inside a food system to control chemical interactions has received little attention. The present research aimed to control moisture migration in a multi-domain cookie (Amaretto) by using an edible coating placed between the internal almond paste and the external crust. The effectiveness of the coating was assessed by three different analyses: water activity (a_w), moisture content and texture (*puncture test*). Moisture content and a_w trends declined rapidly for samples without coating. The Amaretto samples were stored at desiccators with saturated solution of lithium bromide, which enabled accelerated conditions of ($T= 25\text{ C}$, $RH = 8\%$) to speed a thermodynamic equilibrium. The puncture test, area under the curve, indicated that the stress (N/mm^2) to penetrate the non-coated samples was twice as greater than the coated in 10 mm deformation (mm). The final results suggested that the addition of an edible layer between domains at different a_w and chemical potential levels represent a useful tool to control moisture distribution and hence a potential tool to extend the shelf-life of critical foods systems.

Jeffrey Hart, High Technology High School - Lincroft, NJ 07738.

“THE EFFECT OF CATHODE SURFACE AREA ENLARGEMENT VIA ACID CORROSION INDUCED MICRO-FEATURES ON HYDROGEN PRODUCTION IN ELECTROLYSIS OF WATER”

This experiment was designed to improve the effectiveness of electrolysis of water at producing hydrogen, a promising alternative fuel, by increasing the cathodic surface area. To accomplish this, copper electrodes were corroded in nitric acid of varying concentrations (2 Molar – 4 Molar) for sixty minutes. It was hypothesized that as acid concentration increased, electrode surface area would increase. Graphical analysis of electron micrographs of corroded copper as well as analysis of cathode masses before and after acid treatments supported this hypothesis. It was clear that with increasing acid

concentrations, cathodic surface area increased significantly. It was then hypothesized that higher surface area cathodes would produce more hydrogen than less corroded samples. Corroded samples were tested in the electrolysis process against an un-corroded control. Hydrogen gas production was measured by volume. As cathode surface area increased via the use of stronger acid treatments, electrolytic hydrogen production also increased significantly. Increasing cathode surface area on the microscopic level via acid corrosion does allow for more effective electrolytic hydrogen production.

Ami Wang, High Technology High School, Lincroft, NJ 07738

“THE EFFECT OF CHLORINE ON HAIR STRENGTH”

This experiment was conducted to test the difference in strength between hair soaked in water and hair soaked in chlorinated water. Chlorinated water typically has a chlorine concentration of 2ppm, which could possibly damage the hair and make it weaker. Although chlorine is put into pool water for sanitary reasons, it might be doing damage to human hair. This experiment was conducted to see if this was true or not. The student-designed apparatus effectively utilized strands of hair that had soaked in either water or chlorinated water for 2 hours. The apparatus accepted dimes, used as weights, to test the breaking point of each strand of hair. The data was analyzed to see if the amount of weight the water-soaked hair held was more or less than the amount of weight the chlorine-soaked hair held. After statistical analysis through a TTest, it was found that the strength of hair soaked in water is significantly stronger ($p=7.70 \times 10^{-5}$, $\alpha=0.05$) than hair soaked in chlorine.

ENVIRONMENTAL / EARTH SCIENCE

SESSION A

Katherine Dynarski, High Technology High School, Lincroft, NJ 07738.

“IRON SEEDING IN A FRESHWATER SYSTEM AS A FEASIBLE METHOD OF REDUCING ATMOSPHERIC CARBON DIOXIDE”

When a relatively low concentration of iron is added to nutrient-poor areas of the ocean, it causes algal blooms. These algal blooms absorb carbon dioxide in the atmosphere, and when the algae dies and sinks, the trapped carbon dioxide is brought to the bottom of the ocean. This can reduce atmospheric carbon dioxide and lessen the impact of greenhouse gases on

global warming. This experiment aimed to test if this method of reducing atmospheric carbon dioxide was possible in freshwater. Iron was added in three different concentrations (0.005 g/L, 0.016 g/L, and 0.032 g/L) to three closed freshwater systems. There was also one control system with no added iron. The average atmospheric carbon dioxide concentration was measured over a period of two weeks. Regression analysis of the data sets for both the control and the low iron concentration system indicated that the carbon dioxide level did not change significantly over time. Regression analysis of the data sets for medium iron concentration and high iron concentration systems indicated that the carbon dioxide concentration in both systems was significantly lowered. This data strongly suggests that adding a medium to high concentration of iron to a freshwater system can significantly lower the carbon dioxide concentration in the air. If implemented on a large scale, this technique could possibly reduce the carbon dioxide concentration in Earth's atmosphere and help to curb the effects of greenhouse gases and global warming.

Gregory Woolston, High Technology High School, Lincroft, NJ 07738

“THE RESIDENTIAL EFFECT ON GLOBAL WARMING THROUGH THE USE OF CLOTHES DRYERS: A SOLUTION KEEPING CLOTHES AND THE ATMOSPHERE CLEAN”

This study focuses specifically on reducing the amount of Carbon Dioxide (CO₂) emitted from natural gas dryers. In order for this reduction to occur, an algae filter was both designed and constructed, and its effectiveness tested. This student-designed filter is relatively simple in design with a wooden canvas frame surrounding batting fabric for the algae to develop on. A Lexan panel on one side of the panel helped contain the liquid nutrients needed for algae growth. Data came as CO₂ emissions of a standard gas dryer were compared to the emissions of a gas dryer equipped with the algae filter. During experimentation, a Vernier CO₂ Gas Sensor measured CO₂ emissions. Through analysis of the collected data, it was determined that an algae filter of this design was not effective in reducing CO₂ emissions of natural gas clothing dryers. A p-value of 0.9 turned out to be greater than the level of significance of .05, thus failing to support the research hypothesis. Alternative designs employing much greater surface area of algal growth are currently being considered.

Kinjal Patel, Dickinson High School, Jersey City, NJ ,07306

“EVALUATION OF BIOTIC DIVERSITY IN CHIRONOMID POPULATIONS USING HEAD CAPSULE MORPHOLOGY AND HEMOGLOBIN PROTEIN AS BIOMARKERS”

Diverse groups of creatures live in the urban freshwater ecosystems, however with progressively more harmful levels of contaminants being dumped into our environment; creatures are regularly adjusting lifestyles on the molecular level in order to survive. Measures of biotic diversity are good indicators of chronic pollution. Environmental contaminants may induce expression of certain genes in an organism (Lee, 2006). This study compared Head Capsule Morphology with Hemoglobin Protein as biomarkers of biotic diversity. Chironomids, larvae of midge fly, were obtained from the East and the West Branch of the Rahway River in South Orange, New Jersey. Chironomids were collected from seven sites in July, 2007. It was hypothesized that both Head Capsules and Hemoglobin Patterns would be correlated and therefore good biomarkers of biotic diversity. Biotic diversity was detected by visualizing and comparing bands on an agarose gel and by identifying head capsules. Results indicated that there is a correlation between the Head Capsule Morphology and Hemoglobin Patterns. Results also indicated diversity as measured by both Head Capsules and hemoglobin was greater in West Branch than in the East Branch. Both Head Capsule Morphology and Hemoglobin patterns are a simple, yet effective approach to study genetic diversity in chironomid species.

ENVIRONMENTAL/EARTH SCIENCE **SESSION B**

Matthew Warshauer, High Technology High School, Lincroft, NJ 07738
“INVESTIGATING THE RELATIONSHIP BETWEEN PHOTOPERIOD AND RATES OF CARBON FIXATION IN GREEN ALGAE”

The purpose of this experiment was to determine whether the length of the photoperiod had any significant effect on the CO₂ fixation of *Scenedesmus* green algae. Two beakers containing 50 mL of green algal solution were each placed into separate sealed containers, and each was placed in a darkened box. One of the boxes was continuously illuminated with a compact florescent light bulb, while the other was lit for 16 out of every 24 hours. Each of twelve trials ran

under these conditions for 24-hours at a time, and the beakers in the sealed containers were refilled with a fresh batch of green algal solution after each trial. The mean change in CO₂ fixation of the continuous light trials (199.54 ppm) and the partial light trials (187.04 ppm) were not significantly different based upon a two-tailed, paired t-test (p= 0.33, alpha = 0.05). These results fail to support the research hypothesis. There does not appear to be significantly different amounts of carbon dioxide fixed by green algae under continuous light as opposed to green algae under sixteen hours of light per day.

Laura Barry, Science Department, Marine Academy of Technology and Environmental Science, Manahawkin, NJ 08050.

“SEX-BIASED SIZE DIMORPHISM IN *Geothlypis trichas* AS A MEANS OF SEX IDENTIFICATION”

Many species of New-world wood-warblers, Family Parulidae, display sexually-biased size dimorphism. In order to estimate the degree of sexually-biased size dimorphism among a population of male and female Common Yellowthroats (*Geothlypis trichas*), wing length measurements of 127 *G. trichas* were taken. After being captured humanely in a standard mist net apparatus at a banding station in Island Beach State Park during the spring of 2007, *G. trichas* in breeding plumage were banded with aluminum identification bracelets. Natural “unflattened” wing chord measurements (length of closed wing from the wrist to the tip of the longest primary feather) and the recorded sexes of the individual birds were considered in this study. Data from male birds was analyzed separately from that of female birds. *G. trichas* displays male-biased size dimorphism; male *G. trichas* displayed longer wing chord measurements than female *G. trichas*. Using the male and female wing chord ranges (and taking into account the percentage of overlap between the two), a set of practical threshold values can be used to identify an unsexed *G. trichas* in non-breeding fall plumage by wing chord length. The results of this study may augment the existing understanding of the use of wing chord values as a means of sex identification in passerine bird species. With this practical knowledge base, populations may be more accurately assessed for monitoring and conservation programs.

Arati Patel, Dickinson High School, Jersey City, NJ ,07306

“DIFFERENCES IN FORAGING BETWEEN TWO POPULATIONS OF BLUE CRABS”

Contamination is known to alter normal behavior of organism, such as foraging behavior. Two different populations of blue crabs (*Callinectes sapidus*) were tested in order to understand how contaminated ecosystems affect the ability of animals to forage. Hackensack blue crabs were used as the polluted population, while Tuckerton, an open salt marsh located North of Atlantic City, was used as the source of “unpolluted crabs“. To test foraging behavior, prey mussel (*Geukensia demissa*) were placed in a twenty gallon tank and the length of time taken by each crab to catch and attack the prey was recorded. The results show that contamination does affect foraging behavior in blue crabs (*Callinectes sapidus*). Blue crabs from Hackensack took a longer time to catch prey mussel and they exhibited fewer strikes to capture the prey. The prey that the blue crabs consume in Hackensack are contaminated due to pollution in the ecosystem which in turn affects the ability of the blue crab to search for its prey. Contamination is known to bioaccumulate throughout the entire food web causing detriment to the fitness of many organisms. Tuckerton crabs displayed better attempts in capturing prey mussel (*Geukensia demissa*) and showed longer periods of feeding when compared to Hackensack crabs demonstrating that clean ecosystems promote positive relationships between prey and predator.

MARINE SCIENCE

Elizabeth Fuerbacher, Oceanography Department, Marine Academy of Science and Technology, Sandy Hook, NJ 07732.

“SEA LEVEL RISE: A COMPARISON OF LINEAR AND EXPONENTIAL TRENDS AT THE NEW YORK BIGHT”

A worldwide temperature increase of 0.9°C since 1900 has led to oceanic thermal expansion and rising sea levels across the globe. In addition to this eustatic sea level rise (SLR), land subsidence and sediment compaction rates have contributed to an additional rise in sea levels relative to mean sea level that is substantially higher than the IPCC-determined global SLR rate of 2.00 millimeters per year. This study predicted that the exponential SLR rate along the Eastern seaboard would be 20 percent higher than the linear forecast. By reconstructing historical National

Oceanic and Atmospheric Association (NOAA) tidal data from 1911 to 2007 on decadal scales, this study modeled the linear and exponential sea level rise trends for NOAA tidal stations at The Battery, New York, and Atlantic City, New Jersey. Ultimately, the exponential trend at the Battery was 3.05 percent lower than the linear trend, while the exponential trend at Atlantic City was 38.667 percent higher than the linear trend. This research project also found that land subsides at a rate of 0.55 millimeters per year at both locations, while sediment compacts at 1.21 millimeters per year at Atlantic City. These results represent forecasts substantially higher than the original hypothesis of a 20 percent differential between trends for both sites.

Anne Murunga , Dickinson High School, Jersey City, NJ ,07306

“THE EFFECTS OF TERRAMYCIN ON AQUATIC ORGANISMS”

The purpose of this project was to determine the effect of different concentrations of the antibiotic Oxytetracycline Terramycin on the heart rate of *Daphnia magna*. An increase in Terramycin will result in an increase in the heart rate of daphnia. There were 4 beakers labeled A, B, C and D. Each contained 15 daphnia, 200ml of tap water and these concentrations of Terramycin: beaker A- 0mg, beaker B- 3mg, beaker C- 6mg and beaker D-10mg. This was done over a 48 hour period. After every 12 hours, the heart rate was recorded for each beaker. The heart rates were as follows: beaker A- 143.6, beaker B- 149.6, beaker C- 175.2 and beaker D- 186.4. The results of the 3 uncorrelated *t* tests were: (0mg vs. 3mg= -0.74), (0mg vs. 6mg= 4.21) and (0mg vs. 10mg= 5.79). The degrees of freedom, 40, at the level of significance 0.01 were 2.704. Since the calculated values were greater than the table value, the data supports my research hypothesis that the higher the concentration of Terramycin, the greater the heart rate of *Daphnia magna*. Future studies in this area should focus on the long term toxicity effects antibiotics on crustaceans.

Humaira Admani, Science Department, Dickinson High School, Jersey City, NJ 07306

“THE EFFECT OF TURBIDITY ON DISSOLVED OXYGEN LEVELS OVER TIME”

The purpose of this project was to determine if the level of turbidity affected the amount of dissolved oxygen contained in river water over time. It was

expected that high turbidity would decrease the content of dissolved oxygen. Both the level of turbidity was determined through the use of a Secchi disk and the amount of dissolved oxygen contained was processed by performing the Winkler method once a week in the Hudson River for an 8-week period. Measurements were taken throughout the day at 9:00 am, 12:00 noon, and 3:00 pm. In addition, other factors that could have altered the relationship between turbidity and dissolved oxygen such as air and water temperature, pH level, salinity, and tides were also monitored. The mean dissolved oxygen and mean turbidity for the 8-week period at 9 am (9.6 mg/L) (0.47 m), 12 noon (9.2 mg/L) (0.60 m), and 3 pm (9.5 mg/L) (0.58 m) shows that time does play a factor. Regardless of the time, however, as the turbidity increased, the dissolved oxygen decreased, proving the research hypothesis correct. This research helps to determine the health of the Hudson River (New Jersey) for all aquatic animals and organisms and can help prevent future dilemmas that may relate to large fish kills.

MATHEMATICS OR COMPUTER SCIENCE

Moyukh Chatterjee, High Technology High School, Lincroft, NJ 07738.

“COMPARING EFFICIENCIES OF MAGNETIC AND CONVENTIONAL GEAR SYSTEMS”

This experiment compared the relative efficiencies of two different gear systems. The first system was comprised of a conventional plastic spur gear and gear rack, both obtained from ww.kelvin.com. The second system was engineered by the student and involved a magnetic spur gear and gear rack constructed from wood and refrigerator magnets. It was hypothesized that the magnetic gear system would be significantly more efficient than the conventional gear system. Each system underwent a set of 25 trials, with each trial lasting between 4 and 8 seconds. For each trial, the gear rack passed under the gear and displacement measurements were taken of the gear rack before and after contact with the gear (in centimeters) and of the gear immediately after disengaging with the rack (in degrees). These measurements were then used along with the masses of the gear racks and moments of inertia of the gears to produce three kinetic energy calculations (in joules) for each trial, the input kinetic energy of the gear rack, the rotational kinetic energy of the gear rack, and the output kinetic energy of the gear rack. Then, a total efficiency of the gear system for each trial was taken by the calculation

$$\eta = (KE_{output} + KE_{rotational})/KE_{input}$$

resulting in a total of 25 efficiencies calculated for each gear system. The mean efficiencies of the magnetic gear system were significantly greater than the mean efficiencies of the conventional gear system as obtained from a statistical analysis using a 1-tailed, unpaired T-test (p-value = 4.06×10^{-8} , $\alpha = 0.05$). These results supported the research hypothesis.

Andrew Tennant (student), Watchung Hills Regional High School, Warren NJ 07059

“TORSION GROUPS IN FAMILIES OF ELLIPTIC CURVES”

This project is an exploration of trends involving the properties of various families of elliptic curves, using a computational approach. Within the family groupings of curves, patterns may occur among their torsion groups. A torsion group is an abelian group in which all of the elements have finite order. For an elliptic curve, the elements of the torsion group are rational points on the curve, called torsion points. Programs were written in MATLAB to find the torsion groups for four different curve families, two with varying constants, and two with varying x-coefficients. These programs generate the complete set of possible torsion points using the principles of the Nagell-Lutz theorem, and then determine which points actually are torsion points, which is done in a finite number of steps using Mazur’s theorem. Patterns were evident in the torsion groups of the families with varying constants, while the families with varying x-coefficients showed only two torsion points in one family and none in the other. This data suggests that, within the studied families, those with varying constants tend to contain more torsion points as well as demonstrating the effectiveness of using a computer to map out trends.

Shoaib Zahid, Dickinson High School, Jersey City, NJ 07306

“COMPUTATIONAL IDENTIFICATION OF VIRALLY-ENCODED MICRORNA”

MicroRNAs is a single stranded RNA molecule that regulates genes and with the recent discovery that virus’s use microRNA as an infectious vector it is essential to understand how virus’s use microRNA to their advantage. The purpose of this research was to create an effective microRNA prediction program that would successfully locate virally encoded microRNA. This program incorporated support vector machines, feature generation which takes into

consideration the folded secondary structure of the RNA, and machine learning. The prediction rate of microRNA will be greater when using training files that contain calculations of mRNA secondary structure over the other training files. Four feature files were made which contained calculations over entire site, seed region, nonseed region, and mRNA folded structure as well as a set of 50 human microRNA and 23 epstein barr- virus. The classifier which was used was Support Vector machines at a cross- validation of 10- folds. The prediction rate of microRNA was 73% and a t-test was performed at a level of significance value of 0.1, the df was 18 and the t-test values were $3.15 > 1.740$. The creation of the identification program will assist in locating future microRNA as well as identifying microRNA from various databases.

HEALTH/MEDICINE- SESSION A

Ahmar Hashmi, Science Department, Dickinson High School, Jersey City, NJ 07306.

“OPTIMIZATION OF THE FABRICATION OF HUMAN SERUM ALBUMIN MICROSOPHERES BY FRACTIONAL”

Microspheres (MS) are metabolizable solids in spherical form manufactured to encapsulate therapeutic agents or carry a radioactive label. Human serum albumin (HSA) is commonly used as a macromolecule carrier due to its characteristics of biodegrading into natural products, its lack of toxicity and antigenicity. Previous research has indicated the efficacy of albumin MS in site-specific delivery of drugs and nuclear medicine. HSA MS were prepared using water in oil emulsion and stabilized at an elevated temperature of 120°C. MS were then filtered using an 11 micron (μm) filter and rinsed to remove any supernatant oil with petroleum ether. The resulting MS were analyzed through a laser diffraction particle size analyzer (LS13320) and information was verified through optical microscopy. The fractional factorial design employed in the experiment isolated the variables to observe which factor would have the most prevalent influence on the size of the microscopic particles. The mode particle size was calculated and suggested the two most important factors in the preparation of MS were the speed of mechanical agitation and quantity of PBS used. The experiment has successfully demonstrated the effects of several factors and has simplified the process of producing MS of a defined size and distribution.

April Choi, Bergen County Academies, Hackensack, NJ 07601

“EFFECTS OF PBDE AND ARSENIC TRIOXIDE ON HUMAN JURKAT CELLS”

The purpose of my experiment is to observe the combined effects of two bio-accumulative chemicals on human cells in vitro. The two chemicals are arsenic trioxide and polybrominated diphenyl ethers (PBDEs)- brominated flame retardants. In the experiment, human cells were represented by Jurkat T-cells and the PBDE was represented by 1,2,3,4,5 pentabromo benzene. Pentabromo-benzene is formed from PBDEs and may be released into the environment. Arsenic trioxide alone and pentabromo-benzene alone were added to the Jurkat cells in various concentrations, and then, in combination to model the bioaccumulative affects. After 24 hour incubations, cell viability of each well plate was measured using a colorimetric method with a MTS tetrazolium compound along with a trypan blue exclusion viability. IL-2 was also measured using an ELISA in order to determine the effects of these toxins on cell signaling pathways. Results showed that PBDEs stimulate IL-2 production while arsenic trioxide down regulates it. The combined effect of the chemicals was that IL-2 production increased from that of the PBDE but not significantly. Whether the effect was synergistic or additive is unknown. Cell viability was greater with arsenic trioxide than with PBDEs, but cell viability was lower with the combination of the chemicals than with the chemicals alone.

Linda Zhou, Bergen County Academies, Hackensack, NJ 07649

“EFFECT OF GINSENG ON LEUKEMIA CELL VIABILITY”

Ginseng has been touted as a cure all herb for centuries, used in Chinese and Native American medicine to treat everything from fatigue to diabetes to heart and nervous system disorders. The mechanisms of action are not fully understood; however realizing the full scope of ginseng’s effects and separating truth from claimed effects is beneficial to healthcare. This experiment investigates the anti-carcinogenic effect of three different types of ginseng. American ginseng, (*Panax quinquefolius*), and Chinese and Korean ginseng (*Panax ginseng*) were used in five serial three-fold dilutions on cancerous T lymphocyte cells. Cell viability was measured by the transformation of MTS tetrazolium

to Formazan. The assay showed that American and Korean Ginseng had significant anti-proliferative effects on the T-lymphocytes, but had no effect on control Natural Killer cells. This points to specificity in the action of ginseng. Caspase-3 is an intercellular protein that promotes apoptosis. To investigate if ginseng acts by upregulating this protein, an assay was run for caspase-3. The results from this experiment suggest the possible use of ginseng in cancer therapy.

HEALTH/MEDICINE- SESSION B

Jay Srinivasan, Bergen County Academies, Hackensack, NJ 07601

“INDUCING APOPTOSIS IN JURKAT T-LYMPHOCYTES VIA A PROCASPASE ACTIVATOR”

Apoptosis is a natural part of the life of cells, occurring, among other times, when irreparable DNA damage takes place, as a method of preventing replication of a cell with a damaged genome. An important feature of cancer is its ability to ignore natural apoptotic signals, both intrinsic and extrinsic, which is what allows cancer cells to grow invasively, without regard for the signals it receives. Apoptosis is mediated by a series of destructive enzymes, termed caspases, which exist as either initiator caspases or effector caspases. The chief effector caspase is caspase-3, which initiates the caspase cascade, causing a cell to die and bleb apart. The zymogen, procaspase-3 is kept from cleaving by a tri-aspartic acid safety catch. Recently, a molecule (PAC-1) was found that was able to activate the Asp-Asp-Asp “safety catch” and cause cleavage of the procaspase. Different concentrations of PAC-1 were tested in Jurkat cells and natural killer cells, in order to see how the compound would affect normal cells and their cancerous counterparts. A cell proliferation assay was used to determine cell death. Cell death was significant at 10µM PAC-1 concentrations in Jurkat cells, while cell death was only significant at 100µM concentrations in normal (Natural Killer) cells.

Steven Castellano, High Technology High School, Lincroft, New Jersey 07738.

“ACUPRESSURE INDUCED ATTENTION IN THE TEENAGE BRAIN”

Despite the usefulness of modifying the brain’s level of alertness, viable methods for doing so are somewhat lacking. Acupressure is one potential

technique to alter attention that was analyzed in this experiment. Thirty-six teenage subjects applied acupressure to stimulation areas, relaxation areas, or no areas for fifteen minutes each day, and their visual attention skills were measured via enumeration tasks every two weeks after an initial test to attain the subjects' baseline scores. In the enumeration tasks, one to twelve white squares were flashed in a random order on a black computer monitor as subjects recorded the number of squares that they saw during each trial. There were significant differences among the mean scores of all three groups of subjects after each period of fourteen days ($\alpha = 0.05$). The trends in enumeration task scores per day of acupressure were principally logarithmic growth of base e in the stimulation group and logarithmic decay of base e in the relaxation group, while the control group had no significant improvement or regression. There were no significant differences between male and female scores in any subject group. The results suggest that acupressure can be used by teenagers as a means of modifying attentiveness.

Vanessa Kristina Pizutelli Colonia High School, Colonia, NJ 07067

“EVIDENCE OF *Saprolegnia* GROWTH SUPPRESSION ON *Cryptobranchus alleganiensis* MUCOID SECRETIONS”

Saprolegnia is a common fungal parasite of fish and aquatic salamanders, yet reports of *Saprolegnia* infections in an aquatic salamander, the Eastern Hellbender *Cryptobranchus alleganiensis* are infrequently reported in the literature. The relationship between *Saprolegnia* and *Cryptobranchus* was examined through investigations of living specimens in the field and documenting evidence of infections. In addition, laboratory studies in which the amount of *Saprolegnia* growth was quantified and compared between assay growing in the presence and absence of *Cryptobranchus* dermal mucus were performed. During the field studies, several wild hellbenders were observed, approximately 45% of the specimens possessed scarring, but none of which were observed to have been infected. In the laboratory, a significant reduction in the amount of growth of the treated assay possessing hellbender mucoid secretions compared to the untreated assay was achieved ($p < 0.05$). Field studies indicate enhanced immune function in the wild *Cryptobranchus* and lab results suggest possible anti-fungal properties of its dermal secretions. Results encourage future research onto the

bioactivity of *Cryptobranchus mucus*, and its application as treatment for human fungal disease.

MICROBIOLOGY

Dhara Shah, Dickinson High School, Jersey City, NJ 07306

“THE EFFECT OF LIGHT ON THE DEVELOPMENT ON PILOBOLUS”

This project tested the effect of different type of lights on the development of sporangia, the number of sporangiophores shot, and the growth of mycelium of the fungus *Pilobolus*. The fungus was exposed to three different light conditions: incandescent light, no light, and blue light. The hypothesis was that colored light would allow for the most growth. Three rabbit dung agar plates were inoculated with *Pilobolus*. The no light plate was wrapped in aluminum foil, the blue light plate was wrapped in blue filter paper, and the incandescent light plate was wrapped in plastic wrap. Plates were placed under the same light source for two weeks. This process was repeated for a total of 10 trials. *Pilobolus* demonstrated the highest mean of developed (12.4) and developing sporangia (15.4), number of sporangiophores shot (24.8), and length of mycelium (7.25 cm) in blue light. While the no light had the least number of developed (6.8), developing sporangia (9.8), sporangiophores shot (15.2), and length of mycelium (6.9 cm). The incandescent light had a mean of 9.3 of developed sporangia, 12.3 developing sporangiophores, 18.6 sporangiophores shot, and length of mycelium (7.05 cm). The research hypothesis was supported. The fungus *Pilobolus* grew and developed the best when it was exposed to the colored light

Mansi Patel, John F. Kennedy Memorial High School, Iselin, NJ 08830

“USING GLUTAMIC ACID TO ENHANCE THE ANTIBACTERIAL EFFECTS OF GREEN TEA EXTRACT ON *Escherichia coli*”

The purpose of this study is to determine if glutamic acid enhances the antibacterial effects of Green Tea Extract on *Escherichia Coli*. Green tea extract is a common supplement known to fortify health, and is most commonly used for weight loss (Hatano et al., 2003). Glutamic acid is an amino acid that the body produces, and is known to fight pathogenic bacterium, such as *Escherichia Coli*. (Hatano et al., 2007). It was hypothesized that glutamic acid would increase the antibacterial effects of the polyphenols and catechins in epigallocateching gallate (ECGC)

found in Green Tea extract. This hypothesis was based on the conclusion that green tea extract produces more efficient antioxidant results when in the presence of another substance (Hatano, 2007). Bacterial growth exposed to different treatments of green tea extract, glutamic acid, and a combination of both was examined using zones of inhibition. Results showed that all treatments failed to kill bacterial colonies on contact. However, green tea extract and glutamic acid may inhibit growth of bacteria during the exponential growth phase.

Vandan Upadhyaya, John F. Kennedy Memorial High School, Iselin, NJ 08830

“COMPARATIVE ANALYSIS OF THE ANTIMICROBIAL ACTIVITY OF LACTOFERRIN, LACTOFERRIN BOUND TO IRON (III), AND BISMUTH SUBSALICYLATE”

Natural proteins, like lactoferrin, have been found to have substantial antimicrobial properties very similar to commonly used antimicrobial substances like bismuth subsalicylate. The purpose of this study was to see whether lactoferrin’s antimicrobial action could be enhanced if the protein is combined with iron in its ferric form and to compare the results to bismuth subsalicylate. It was hypothesized that lactoferrin in combination with FeSO_4 would be most effective because as bacteria sequester iron they uptake lactoferrin. ANOVA showed that lactoferrin combined with FeSO_4 had a significantly greater antimicrobial action in comparison to other two treatments.

PHYSICS/ENGINEERING- SESSION A

Tanay Gavankar, High Technology High School, Lincroft, NJ 07738.

“UTILIZATION OF SILICA NANOPARTICLES IN SHEAR THICKENING FLUIDS AS LIQUID BALLISTIC PROTECTION”

When Kevlar is infused with silica nanoparticles in ethylene glycol, the Kevlar takes on the rheological properties of a shear thickening fluid and behaves in a non-Newtonian manner, becoming relatively pierce resistant. Under high shear stress and high impact forces, the viscosity of the Kevlar dramatically increases in a minute amount of time to maintain the fabric’s integrity until the force is removed, when it returns to its flexible state. The factor that was tested was if size of the silica nanoparticles infused in Kevlar affects the Kevlar’s pierce resistance. If both 12 nm and 100 nm silica nanoparticles are tested

under the same conditions, then there will be a significant difference in the pointed impact penetration depth of the two. To test, 2 silica nanoparticle solutions (12 nm, 100 nm) in ethylene glycol were infused in Kevlar and were subjected to high sharp impact forces. A t-test was applied to compare the results of the 100 nm solution treated Kevlar vs. the 12 nm solution treated Kevlar and the results (p-value: 0.00029, alpha: 0.05) indicate that 100 nm solution was significantly more effective. Benefits of this technology assist in creating lightweight, flexible body armor that can be used for people who work in the field and are in danger of knife attacks, flying shrapnel, bullets, etc.

Andrei Tapliga, High Technology High School, Lincroft, NJ 07738

“THE EFFECT OF LEADING EDGE WING DESIGN ON GLIDER FLIGHT TIME”

This project compares the effect of wing design as it affects the flight time of a model balsawood glider. A single model glider was used, and two sets of different wings were utilized for the trials. One set of wings had three concave curves on the leading edge of each wing while the second set used the original wing design without any curves on the leading edges. The trials were performed in a gymnasium, and for each trial the glider was propelled off of a launching pad which was inclined downwards towards the lower gym. After the glider was launched, the time it spent afloat was recorded. The data shows that a significant difference ($p = 1.07 \times 10^{-2}$, $\alpha = 0.05$) did exist between flight times. The flight times of the glider when using regular wings were usually greater than when using the wings with the multiple curves.

Frederick Teng, Sage Day High School, Rochelle Park, NJ 07662

“MHD GENERATOR FOR OCEAN POWER STATION”

An application for a Magnetic Hydrodynamic generator for the utilization of energy of ocean waves was developed. We implemented this MHD generator within our previous year’s project, which was designed to utilize the energy of water motion under the surface. By implementing the MHD generators, which are regularly used to generate electricity by means of the conductive media movements through the magnetic field, we decrease the requirements to the design of our station. We can implement MHD generators because of the electrical conductivity of

ocean water. The best way to create a power station is to place it on ocean boats and collect the ocean wave energy. We keep the structure of our system like a lattice. Each cell of this lattice is equipped with required elements of MHD generators: a magnetic system and a set of electrodes. Each cell is surrounded by two permanent magnets. The optimal configuration of the magnetic field is provided by thin planes of the permanent magnets, and each of them is mounted between two rows of cells. The direction of magnetization of these magnets is perpendicular to their planes. The cells were designed as a thin rectangle with electrodes on both sides. This system could work without any technical assistance for a long time.

PHYSICS/ENGINEERING- SESSION B

Eva Salinas Bergen County Technical High School, Creskill, NJ, 07626

“EVALUATION OF TREATED SEDIMENTS LEACHING BEYOND THE STANDARD TCLP 18 HOUR PERIOD”

Treated dredged sediments have the potential to be of great use for construction and land remediation. The Novosol process developed by Solvey (Kribi, 2004) is a procedure designed to treat dredged sediments in order for them to be reused commercially in the construction industry. Before the sediments can be used commercially, however, studies must prove that no harmful material can leach from the treated sediments into the groundwater. The standard TCLP leaching tests utilizes 18 hours extraction period (U.S EPA, 1992). The chosen extraction period is arbitrary and recent studies of nickel stabilization prove that not all metals are able to reach equilibrium state within 18 hours. Leaching is a long-term process; however, it is possible that longer testing period could result in significant leaching. In this study varying extraction periods were used to test the treatment process. Leaching of metals from treated sediments was significantly lower than that from untreated ones. The leaching Zn, Pb, Cd, and Ni did not reach equilibrium at 18 hours for both treated and untreated sediment samples. The study showed that extended extraction period provides more information on the sediment treatment than can be obtained with the standard 18 hour TCLP leaching test.

Chintan Rajput, Dickinson High School, Jersey City, NJ ,07306

“THE EFFECT OF CALCIUM CROSS-LINKING ON CONTROL RELEASE PECTIN FILMS”

The ability of Pectin to form polymer matrices and release an entrapped drug makes it a suitable match for control-release applications. Calcium chloride (0, 9, 18mg) was added to LM Pectin with different Degree of esterification (DE12, 18, 22) to produce Pectin films. Films were placed in 20 mL of 8%-ethanol solution to test for swelling and dissolution. Degree of swelling for DE-22 with 18mg CaCl/g pectin was 328.74% while swelling for DE-12 with 18mg CaCl/g pectin was 1423.34%. Pectin DE-22 dissolved within 24 minutes while Pectin DE-12 dissolved within 2483 minutes. Similar trends of swelling and dissolution were visible in other tested cross-linked pectin films. Low DE Pectin allowed more Calcium Cross-links to form resulting in films which allowed less water to enter and separate polymer matrices. Low DE pectin presented lower rates of swelling and dissolution and film was able to sustain structure at higher degree of swelling compared to high DE pectin which allowed high rates of swelling and dissolution due to less cross-linking. Therefore, immediate relief drugs can be made with fewer cross-linked films to achieve faster dissolution, while extended relief drugs can be made with more cross-linked films to maximize effect and lower dose frequency.

Rachel Mann, High Technology High School, Lincroft NJ 07738

“THE EFFECT OF A BLUNT FORCE IMPACT ON GLASS WITH DIFFERENT COATINGS”

The objective of this experiment was to establish if applying different coatings to glass would affect the impact needed to break the glass. A control glass that had no coating on it was used, as was glass coated with window clings (decorations often placed on windows during the holiday), and glass with a security window film, specifically manufactured to protect glass. The hypothesis was that both window coatings would increase the magnitude of impact needed to break the glass. A structure was built to hold the glass panes along with a hammer for impacting the glass. The hammer was released at specific angles to deliver progressively stronger impacts. Shatter points were recorded. Data analysis revealed no significant differences ($p = 0.303$, $\alpha = .05$) among the three groups.

**2008 ANNUAL MEETING
SENIOR ACADEMY AWARDS**

Graduate Students

- 1.) Christopher Langer
- 2.) Charles C. Kontos
- 3.) Susan Jankovic

Undergraduate Students Session B

- 1.) Omar Padron
- 2.) Courtney Cunningham
- 3.) Jessica Keipet

Undergraduate Students Session A

- 1.) Dana Patterson
- 2.) Michael Messina
- 3.) Judy Brummer



New Jersey Academy of Science

2008 Election Ballot

President-Elect (vote for 1)

Paul Bologna

Write-in candidate

Abstain

Secretary

Eric Iannacone

Write-in candidate

Abstain

THE BULLETIN: CALL FOR MANUSCRIPTS

Individuals seeking publication of their work are urged to consider submitting their manuscripts to *The Bulletin*, The peer-reviewed journal of the New Jersey Academy of Science. We are currently on a twice-yearly publication schedule, which consists of a spring and a fall issue.

Original papers and reviews in any field of science are considered for publication. Manuscripts should be submitted to Dr. Michael Kennish, Editor, Institute for Marine & Coastal Sciences, Rutgers University, 71 Dudley Rd. New Brunswick, NJ 08901. Instructions for contributors are printed on the inside back cover of each issue of *The Bulletin* and are now available on the NJAS website (www.NJAS.org), in the Bulletin section. Anyone having questions about the review and/or publication process should contact the editor at (732) 932-6555, ext. 240 or kennish@imcs.rutgers.edu.

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