

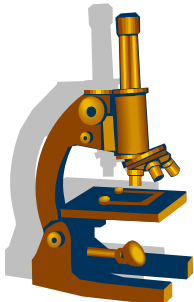
# Marine Academy of Technology & Environmental Science



## Fourth Annual Freshman Research Showcase

Abstract Guide

April 21, 2010



It is hard to believe that this is our fourth year. This poster session has all the makings to be the best ever.

This was a great year for student research. All freshmen were required to conduct an independent experiment or a review of research. Once completed, the students completed a poster culminating in our poster session on April 21, 2010. Many hours went into the projects. Our 63 freshmen are presenting experiments (38) or reviews (25). The categories are as follows:

**EXPERIMENTS (5 CATEGORIES)**

<b>BEHAV. HUMAN</b>	<b>Behavioral: Human Subjects</b>
<b>BOT &amp; ZOO</b>	<b>Botany and Zoology Experiments</b>
<b>ENV. HEALTH</b>	<b>Environmental Science and Health Sciences</b>
<b>MATH &amp; COMP. SCI.</b>	<b>Math, Computational and Computer Science</b>
<b>MARINE SCIENCE</b>	<b>Marine Science, Estuarine Science, and Marine Ecology</b>

**REVIEWS (3 CATEGORIES)**

<b>BEHAVIORAL</b>	<b>Behavioral and Social Sciences</b>
<b>ENV. ECO</b>	<b>Environmental, Ecologically-based Reviews</b>
<b>ENV. HEALTH</b>	<b>Environmental Science and related Health Issues</b>

We would like to thank the Class of 2013 for an outstanding project presentation this year. Twelve of the students participated in the 2010 Jersey Shore Science Fair on March 20, 2010 and four qualified for the prestigious Delaware Valley Science Fair on April 7, 2010. All of the students worked hard and it will show in the following abstracts and during the poster session.

We wish to thank our Ocean County Vocational Technical School Board of Education, Administration (Mr. Hoey, Ms. Weber-Loeffert, Mr. Frazee, and Ms. Carroll) and MATES Staff, especially Mr. Jason Kelsey, Mr. Adam Sprague, Ms. Mia Dill, Ms. Maryann Minnier and Ms. Kelly Zatta who served as mentors to our students. Also, thanks to those behind the scenes who helped with printing and ordering poster board, etc... Ms. Debbie Koehler and Ms. Ester Gallacchio.

A very special thanks to the parents who have contributed much time and effort in making the projects possible. Without their support, this research day would not be possible. Some parents even gave up garage and house space for the projects!

And, last, but not least, thanks to our partners who supported some of the projects as well as those who have volunteered to judge the projects. Your support of MATES and its students is greatly appreciated!

Sincerely,

John Wnek, supervisor,  
Science and Research

## **EXPERIMENTS:**

### **1. WHAT EFFECT DOES COFFEE HAVE ON THE GROWTH OF TOMATO PLANTS?**

Morgan Anderson, 4<sup>th</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. John Wnek and Mr. Adam Sprague **BOT & ZOO**

Leftover coffee usually just ends up down the drain and has no use. Studies have already been conducted on coffee grounds but what about brewed coffee? What effect does caffeinated and decaffeinated coffee have on the growth of plants? Using water as a control liquid, the study was conducted for 8 days; every other day in that time period the plants received the liquid that corresponded with its designated plant. If these different liquids are added to plants, due to an increase in nitrogen and an increase in the acidity of the soil, the plants with coffee added to them will grow larger than the control group with water. The results of the experiment showed that the hypothesis is proven because plants one and two with caffeinated coffee and plants five and six with decaffeinated coffee grew at a more rapid rate than the control group, plants three and four.

### **2. DO ANIMALS WITH LESS INTELLIGENT THAN DOGS REACT TO PAVLOVIAN CONDITIONING?**

Shelly Applegate 4<sup>th</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Adam Sprague, and Miss Kelly Zatta. **BOT & ZOO**

Ivan Pavlov studied the physiological eating effects in dogs, and he noticed that the dog began to salivate when presented with food. By providing a neutral stimulus (in this case a bell- something that would not normally make the dog salivate) he was able to make the dog salivate on command. He stated that all animals, including humans, can be trained or conditioned, and in order to prove his results accurate I attempted to train or condition animals with less intelligence than dogs. These animals included a field mouse, a gerbil, and a guinea pig, all in which are classified as rodents. I also conditioned my dog as a control experiment in order to compare the results. The experiment that I performed was to see if the animal would be able to recognize when it was receiving food by being presented with a neutral stimulus before each feeding. The neutral stimulus was a bicycle bell which was rung before each feeding. The experiment showed that even though the animals with less intelligence were able to be conditioned, it took significantly more time for them to become conditioned. Pavlov was correct when saying all animals, including humans could be trained or conditioned.

### **3. HYDROGEN PEROXIDE: HOW MANY PEOPLE ARE AWARE OF THIS HAZARD IN A BOTTLE?**

Alyssa Baker, 4<sup>th</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey **BEHAV. HUMAN**

Hydrogen peroxide ( $H_2O_2$ ), which is an advertised ingredient in whitening toothpastes and is used often as a “home remedy” for disinfecting cuts, is misconceived to be perfectly safe. This harmful chemical can in fact damage the body, in more ways than one. My research began by conducting a survey to find out how many people from a given sample had basic knowledge of the dangers of  $H_2O_2$ . The survey consists of yes/ no questions that relate to the participant’s daily use of  $H_2O_2$  and statements (that may or may not be true) about the chemical. The survey was given out publicly on different venues around the local area and also online. The data from the surveys was then set up in a table and graphed to see the correlation between different aspects of the survey. All of this data was analyzed to see if any of the graphs were related. The data showed that for each statement, about half of the people in the sample were correct. My conclusion is that in a given sample of people, approximately half of them will have used or purchased  $H_2O_2$  in some form. Also, approximately half of the people in the survey will know the basic knowledge of the harm this chemical is capable of inflicting.

#### **4. IS IT POSSIBLE TO TASTE WITHOUT SMELL?**

Morgan Bent, Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey **BEHAV. HUMAN**

Many people do not realize that it is almost impossible to distinguish tastes without the sense of smell. The sense of taste and the sense of smell go hand-in-hand. To prove that tastes cannot be distinguished without smell, an experiment was conducted with various foods, all with very different tastes. These foods consisted of raw potatoes, apples, pickles, pears, lemons, oranges, and chocolate. The volunteers tried to distinguish these tastes first without their sense of smell, and then with it. By looking at the data collected, it is clear to see that almost every volunteer could not tell what they were eating without their sense of smell, which demonstrates that there is a correlation between taste and smell. Therefore, it is almost impossible to distinguish tastes without a sense of smell.

#### **5. HOW DO SHORE SHRIMP REACT TO CHANGES IN THE ENVIRONMENT?**

Jake Cannon, 1<sup>ST</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague **MARINE SCIENCE**

Habitat is a critical factor for the success of many benthic organisms found in estuaries. An important organism in the estuary food chain, the shore shrimp (*Palaemonetes* sp.) are found throughout many areas of the Barnegat Bay Estuary. Barnegat Bay, like other estuaries world-wide, is facing human impacts which alter water quality and benthic habitat. The objective of this experiment was to observe shore shrimp in a controlled environment. The shore shrimp were gathered at Ship Bottom, N.J, and were placed in a twenty gallon tank filled with bay water and sand. The shrimps' behavior was observed for a month until the experiment was started. A transparent divider was placed in the tank and it was split in half. The sand was replaced by different colored gravel on one side, and the behavior and physical traits were observed on both sides of the tank. Each type of gravel remained the same for a month and compared to the sand side. A pigment change was observed due to the shore shrimps' chromatophores. This was affected by the color of the environment. The shrimps' diet was also observed by the color under their carapace.

#### **6. SHOULD SCHOOLS DEMAND THAT NINTH GRADERS LEARN ANOTHER LANGUAGE?**

Jordyn Caporale, 1<sup>ST</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Kelsey **BEHAV. HUMAN**

Many school districts in the United States have a requirement that students must study a second language for their first year of high school. However, this may not be the most effective method due to the fact that ninth graders do not have a fully developed memory. The language they study is less likely to be remembered if it is not constantly refreshed and practiced. In order to prove that learning a second language should either be postponed until the brain is fully developed, or started earlier and taught longer to ensure that better retention, I performed a study where freshmen students were tested in both their short-term and long-term memory by teaching the students simple signs in sign language. They were then asked to sign those that they remembered after varying time periods. This study showed that freshmen sampled only remember about 96% of the information they learn during the first five to ten minutes and about 91.5% after a 24-hour time span. This is most-likely due to the fact that the "hippocampus", the part of the brain that transfers short-term memories to long-term memories is not fully developed at this age.

## **7. DOES STORAGE TEMPERATURE AFFECT THE TASTE OF JUICE?**

Ryan Christiansen, 3<sup>rd</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisors: Mr. Adam Sprague and Mr. John Wnek

**ENV. & HEALTH**

Anyone who walks into a grocery store can find juice either on the shelf or cooler section, but does that affect the taste? Changes in pH may be attributed to changes in temperature which can affect the taste. To test the hypothesis that storage temperatures can change pH, experimental trials were conducted with ten different juices; apple, orange, lemon, pear, pomegranate, carrot, tomato, prune, grapefruit, and grape were. While testing the pH taste and smell of those ten juices was also tested. The pH of the juice was tested at ten different temperature ranges from 1.7 to 26.7 degrees Celsius (35 to 80 degrees Fahrenheit) in intervals of 5 degrees Fahrenheit. The data suggests that temperature did impact the juices' pH. This also affected the taste and aroma of the juices.

## **8. MACINTOSH OR WINDOWS: WHICH IS REALLY FASTER?**

Jake Convery, 1<sup>ST</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Mr. Adam Sprague

**MATH & COMP. SCI.**

Ever since the initial release of the Apple Macintosh in 1984 and Microsoft Windows in 1985, the platforms have been feuding as to which is more beneficial for computing. Some feel that Microsoft Windows is a superior platform for everyday and professional computing, while others feel that the Apple Macintosh platform is better for everyday and professional computing. To determine which platform is faster for computing, I tested two desktop machines and two laptop machines manufactured from 2007 to 2008 running everyday software native to their platform, such as the operating system, Microsoft Office, and Adobe Photoshop CS4. Then, all results were analyzed to statistically determine which computer is faster. Our results indicate that each platform has been proven to have its strengths and in specific functions. Most notably, the installation of Microsoft Windows Vista operating system is faster than that of the Apple Macintosh Operating System 10.5.

## **9. THE HUMAN MEMORY UNDER STRESS**

William Cusick, 4<sup>th</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Mr. Sprague

**BEHAV. HUMAN**

The problem I was trying to solve was whether or not eyewitness accounts are reliable when people are stressed. There is a gap in research here, as to my knowledge there have been few tests regarding facial recognition under stress. To get my results, I used a poster with twelve faces on it. I did two trials; one where the subjects had four minutes time to memorize the faces, and one where the subjects had two minutes. Afterwards, I used a simple test to determine an average score and compare them from each trial. After the experiment was complete, I found that the group with the two minute time limit scored significantly lower on average then the group with four minutes. This experiment proved that the human memory is unreliable in cases such as these. This also helps fill the gap in tests of facial recognition after childhood in that it tests how well people can recognize and remember a face in a given time.

## **10. A COMPARISON OF THE FLOW RATES AT THE FRONT AND BACK OF THE LAGOONS IN BARNEGAT BAY**

Joey DeLosa, 3<sup>rd</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey. **ENV. & HEALTH**

Barnegat Bay has long been home to not only thousands of people, but also the home of various aquatic fauna and animals. Recently the waters around the town are becoming polluted. Normally the bay has the ability to “turn itself over”, or push its waters into the ocean and back in again. The rate at which this occurs is commonly called the flow rate. The flow rate in the open water is generally fast, but my goal was to see if the irrigation of the lagoons had had any effect on the flow rate in the bay. To do this I did tests at a lagoon in the back of the bay and a lagoon in the front of the bay. The tests consisted of measuring out a distance of three feet and letting a homemade flow meter travel the distance while timing it then record how long it took the flow meter to travel the three feet. I determined a mathematical equation for speed to discover how many feet the water traveled per second. When the data was compared, it was found that there is in fact a difference in flow rates in the front and back of the lagoons. The front of the lagoon was a little faster than the back. In conclusion, it was found that the front of lagoons do in fact flow faster than the back of lagoons, but the difference in rate is small and could almost be considered negligible.

## **11. THE EFFECT OF LIGHT ON PLANT GROWTH**

Matt Dentroux, Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague **BOT & ZOO**

Light is one of the most important environmental factors for plants, acting as a source of external stimulation, affecting their growth and development. It was one of their main sources of energy. The effects of light spectral quality on plant growth and development have been investigated for many years. To find out the effects of different wavelengths of light on plants, specifically blue-violet light, I used different colored lights on elf sunflower plants. Ten elf sunflowers were planted in cups. Four different colors of cellophane were placed over eight of the sunflowers, two sunflowers per color. Two sunflowers had clear cellophane placed over them to observe how the plant would grow in normal conditions. The sunflowers were measured weekly. The data showed that plants under violet light had the greatest growth, while plants under blue light had the least growth. Therefore, I conclude that violet light has the greatest impact on plant growth. .

## **12. CAN FINGERPRINTS BE GENETIC?**

Kelly Dowd, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES)  
Advisors: Mr. Jason Kelsey and Mr. John Wnek **MATH & COMP. SCI.**

Fingerprinting is a widely used practice in forensic sciences. It is frequently used in crime scenes by the investigators that collect the samples and return them back into the lab for testing. They compare the shape of the fingerprint, as well as looking into the more complex versions of this certain shape. Finally, the analyzer would look for 10 key points such as abrupt endings in a line, the core and delta of the finger prints, as well as if there are any visible scars that came up in the sample. This experiment looks at any possible similarities that any family members have with each other regarding their fingerprints. These similarities could add up to obvious problems in the fingerprinting and criminal justice system if the fingerprints are too much alike. To test this, samples were taken from 5 families and 4 sets of twins and their fingerprints were compared. This way, the average chance that a person could be misidentified could be established.

### **13. DOES SEED SIZE MATTER?**

Andrew Downs, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Sprague **BOT & ZOO**

The purpose of this experiment was to determine whether or not the initial size of a Lima bean seed has any effect on the plant's development. Ten seeds were tested in the experiment. These seeds were measured and then planted in a plant tray. Each of the ten seeds was kept under the same conditions to ensure that seed size was the only variable. This means that they received the same amount of water and sunlight. The plant tray was kept indoors and was watered roughly every two days. Observations of the seeds development were made and recorded. At the end of the experiment (which lasted 44 days), final observations were made, the data was compiled, and conclusions were drawn.

### **14. CAN CONTINUED EXPOSURE OF BACTERIA TO HAND SANITIZER LEAD TO RESISTANCE?**

Natalie Einselen, 3rd Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Jason Kelsey and Mr. John Wnek **ENV. & HEALTH**

Over recent years, America has become increasingly anti-germ. With outbreaks such as MRSA, an antibiotic resistant staph infection, people feel the need more than ever to keep clean by using products that claim to kill up to 99.99% of germs. However, use of these products could be more harmful than helpful. For example, can the .01% of bacteria that is not affected by alcohol-based hand sanitizers develop a resistance to the product? In order to test this, bacteria was exposed to Purell Hand Sanitizer over a period of time, and the distance of growth from the sanitizer was measured. Then, the bacteria growth closest to the Purell would be re-cultured and exposed again to the sanitizer, and the distance measured once again. This process revealed that, over time, bacteria can become more resistant to Purell Hand Sanitizer.

### **15. THE EFFECTS OF OSMOREGULATION ON MUMMICHOGS**

Chris Etler, 1st Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Adam Sprague and Ms. Kelly Zatta. **MARINE SCIENCE**

Mummichogs (*Fundulus heteroclitus*) are a type of killifish that is found mainly salt marshes. Salt marshes have varying salt levels that can change based on many factors, including location, precipitation, and evaporation. This change in salinity can cause a change in the weight of the fish inhabiting the marsh due to osmoregulation. Osmoregulation is a homeostatic mechanism in saltwater fish that allow it to deal with changes in salinity. This happens because of the salt ion differences between water and within the fish. Osmosis causes the salt to diffuse into the fish until the levels are equal. A mummichog will either preserve water or let out excess water as ammonia (similar to urine in humans, but released through the gills). To test whether or not this can cause a drastic change in weight, I set up three fish tanks, each with three fish. One tank had a constant salinity of 15ppt (parts per thousand) while the other two had varying amounts of salt. The experiment was conducted over two months and comparisons were made between time (in days) and weight (g) Based on the results of this experiment, salinity has little effect on weight over two months, but there are small short-term weight changes in mummichogs. Factors such as food have a greater impact on the weight of a mummichog.

## **16. WHAT EFFECT DOES SALINITY HAVE ON MUMMICHOGS (*Fundulus heteroclitus*)?**

David Etler, 3<sup>rd</sup> Block Science Class, Marine Academy of Environmental Science and Technology (MATES),  
Advisor: Mr. Kelsey **MARINE SCIENCE**

In nature, salinity plays a big role on both animal and plant life. Salt can destroy plant life, and make water undrinkable. But does salt have an effect on fish in captivity? For this experiment, I took 9 mummichogs (*Fundulus Heteroclitus*) from Cattus Island Park as part of an experiment. Mummichog are a species of marine fish that live in salt marsh habitats. The mummichog were separated into three separate tanks with three fish in each tank. The three tanks had salinity of 15, 30 and 40 PPT respectively. Over the course of one month (1/1/10 – 1/29/10) the mummichogs were all fed the same amount of food in each tank and had all other conditions equal (besides for salinity). Every other day, measurements were taken from each tank of the overall weight (g) of the fish. Then that number was divided by three to get the average weight per fish and subtracted by the previous day to get a daily change. The results show that mummichogs in tank two (salinity of 30 PPT) had little weight (g) change and mummichogs in tank three (salinity of 40 PPT) had the most growth. This may important information for the future of mummichog as sea level rise brings a greater amount of salt water into estuaries, thus changes in salinity in salt marsh habitats.

## **17. THE EFFECTS OF POLLUTION ON BRINE SHRIMP**

Eugene Filik, Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague **MARINE SCIENCE**

Brine shrimp, *Artemia salina*, are very small crustaceans that are around fifteen millimeters in length. There is extreme cause for alarm because if the ecosystem is disrupted, the disruption could send it into chaos. In this project, two different types of common chemicals were tested in two tanks of approximately 200 brine shrimp each, several times in different amounts to test how they affected the shrimp's habitat. The two selected chemicals that were used were two-cycle motor oil and bilge cleaner. The two-cycle motor oil is commonly used for water vehicles such as boats or jet skis. The bilge cleaner is used to clean the used oil out of the vehicle. These chemicals are pollutions to living things are more likely to affect organisms lower on the food chain as a result of biomagnification. Brine shrimp are common parts of many fish's diets and if their population declines it could affect the health of the fish and cause damage to the ecosystem. This research project explains the devastating effects of pollution on brine shrimp and how it relates to the ecosystem.

## **18. CAN BIOFOULING BE PREVENTED WITH NATURAL SUBSTANCES?**

Honour Harrington, 3<sup>rd</sup> Block Science Class, Marine Academy of Technology and Environmental Science  
(MATES), Advisors: Mr. John Wnek and Mr. Adam Sprague. **MARINE SCIENCE**

The bottoms of boats provide the ideal living space for biofouling agents. The growth is harmful to boats; however, the antifouling paints used to prevent it are *extremely* harmful to marine life. The problem of too many, too harmful, antifouling paints and their detrimental effects on marine life is one that concerns many scientists. I created two experimental samples of un-harmful antifouling paints (a mixture of lime juice and white latex paint; a mixture of olive oil and white latex paint) to test whether or natural substances can serve as antifouling agents. I used a sample of the fiberglass boats are commonly made of, and I divided it into four parts. The first section I left un-treated, the second I painted with commercial antifouling paint, the third I painted with the lime juice mixture, and the fourth I painted with the olive oil mixture. I left this sample in the Toms River for about two months. When the sample was removed, I concluded that the olive oil did not prevent growth; if anything, it encouraged it. The lime juice was very similar in results to the commercial product, and therefore was determined to be the better of the two samples.



## **19. THE EFFECTS OF WATER WISTERIA ON WATER QUALITY AND FISH**

Matt Hogan, 3<sup>rd</sup> Block Chemistry Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Adam Sprague and Mr. Jason Kelsey **BOT & ZOO**

Freshwater aquariums are popular in many homes and businesses in the United States. While raising freshwater fish is a relatively inexpensive endeavor as compared to caring for a pet such as a dog, the maintenance costs can add up. The addition of aquatic plants, such as the Water Wisteria (*Hygrophila difformis*) can help keep those costs down since it helps maintain water quality without the need for costly chemicals. The use of aquatic plants is more beneficial to marine life since it is a natural way to provide needed oxygen, absorb excess carbon dioxide, and support healthy growth. I began my research by obtaining fish and two aquarium tanks. Once the two tanks were established with three Buenos Aires Tetras in each, I placed a Water Wisteria in one tank only. Over the span of about five months, I collected data on a variety of factors relating to water quality including temperature, the level of nitrite, nitrate, chlorine, Ph, ammonia, and hardness. I also measured the average length of fish at regular intervals. The data was recorded in a table and then graphed to compare each category. The data showed that both the nitrate levels and algae growth were well controlled in the tank containing the Water Wisteria. The fish in this tank also grew at a faster rate. As a result, I have come to the conclusion that the Water Wisteria absorbed algae and regulated the nitrate levels in the water, supporting the growth rate of the fish. Further, I conclude use of the Water Wisteria is a more effective alternative to traditional chemical maintenance since no chemicals were needed during the experiment to provide a healthy marine environment.

## **20. DOES THE USE NITROGEN AND PHOSPHOROUS AFFECT THE HEALTH OF KILLIFISH IN THE WATERS OF OUR BACK BAYS AND LAGOONS?**

Brian Intile, 3<sup>rd</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Jason Kelsey, Ms. Clarissa Green, and Mrs. Mia Dill. **ENV. & HEALTH**

Fertilizers contribute significantly to the yield of crop growth and the income of the farming industry. They are used worldwide by many consumers, including farmers and home owners. Fertilizers can be applied in many different ways, and some are better than others. However, fertilizers can runoff with rainwater or be carried by wind, especially if sprayed in large quantities. When the dangerous chemicals such as Nitrogen and Phosphorous from fertilizers run off into water they cause a condition known as "Eutrophication." Eutrophication is best described as the process in which slow moving bodies of water such as lakes, bays and streams become over saturated with excess nutrients and therefore experience excessive plant growth. This enhanced plant growth, also known as algae bloom, causes a reduction in the available oxygen in the water as the dead plant material decomposes, which in turn causes fish and other organisms to die. These chemicals also cause the PH level of the water to lower or become more acidic. Data from numerous studies have shown that increased acidity levels in seawater has been known to cause decreased metabolism and reproduction levels as well as a significant increase in mortality rate. In my experiment I will construct 2 identical saltwater aquariums (control tank #1 and variable tank #2), including live plants. Each aquarium will start with 40 liters of distilled water and sea salt until a PH level of 8.5 is achieved. I will add 1 dozen killifish to each tank. Each day 5ml of Miracle Gro liquid fertilizer (4% Nitrogen, 12% Phosphorus) will be added to the variable tank and I will record the PH, water temperature, plant growth, fish activity levels and mortality rate in each tank. Once all data was recorded, I added the results to spreadsheets and graphs. It was easy to see that as the acidity level of the water rose the activity level decreased and the mortality rate increased significantly. It was also apparent that the aquatic plants in the tank that contained the fertilizer chemicals had increased in size compared to the tank without the chemicals. Based on this data I have concluded that the Phosphorous and Nitrogen content in fertilizers that get introduced into our bays, rivers and streams is causing these waterways to become more acidic and therefore negatively affecting the health and activity levels of killifish.

## **21. WHAT ARE THE DIFFERENCES BETWEEN VEGETATION IN DISTURBED AND UNDISTURBED REGIONS?**

Chris McDonald, 4<sup>th</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Adam Sprague and Mr. John Wnek **ENV. & HEALTH**

In a certain perspective, it is possible to classify wooded regions by disturbed and undisturbed regions. There has been speculation about the differences of the two, but available research with actual statistics is lacking. Even reliable scientific databases have very little on the topic. With this in mind, the topic was chosen to experiment on. I obtained permission to utilize a local Boy Scout camp for experimentation. Using a topographical map acquired through the United States Geological Service (USGS) two regions were chosen as the disturbed and undisturbed areas. Three trials of the line transect method were performed in each of the areas as well as a vegetation survey. The data was compared so that the dissimilarities between the two regions could be found. The data suggests that the vegetation is more dense in the undisturbed region than in the disturbed region.

## **22. DOES THE TYPE OF SCHOOL A TEENAGER ATTENDS AFFECT THE LEVELS OF PEER PRESSURE THAT THE TEENAGER WILL FACE?**

Anju Malhotra, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague **BEHAV. HUMAN**

Teenagers are surrounded and influenced by the peers that they see everyday at school. Some schools have theme-based curricula that attract a specific type of people while other schools have a more diverse population. Does the type of school a child attends affect the level of peer pressure that a student faces? In order to determine this, 80 freshman from two different schools were surveyed: a typical public high school (Brick Township High School), and a smaller theme-based school (the Marine Academy of Technology and Environmental Science). The results were then compared to determine if the type of school affected the amount of peer pressure that the students faced.

## **23. CAN A DOG PERFORM A LEARNED BEHAVIOR WITHOUT ANYONE THERE TO TELL IT TO DO SO?**

Kaitlyn Maio, 4<sup>th</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. John Wnek, Mr. Adam Sprague, and Mr. Jason Kelsey **BOT & ZOO**

For most of the approximately 16,000 years dogs have been domesticated, people have been trying to train them to do what they are told. While dog owners may often get their dog to learn a command, it is still a struggle for many to get their dog to perform this command automatically without the trainer having to tell them so. I chose to see if a dog could perform a learned behavior without anyone there to tell it to do so. The behavior that I chose to test was for a dog to not go into any type of garbage receptacle. My experiment involved a period of training a dog to perform the command, using a system of positive reinforcement for each time the dog did as commanded and the punishment of being sprayed lightly with water each time the dog tried to go into the garbage can. There was then a period of leaving the dog alone with the garbage can to see if she would perform the command on her own accord while being videotaped the whole time. All performance of the behavior was then stopped for the period of one week, and then resumed for a final week where the dog was alone with the garbage can once more and recorded. The data showed that the majority of the time that the dog when left alone did not go into the trash container. However, the data also showed that out of the relatively few times that the dog did go into the garbage, it was more often when the dog was completely alone in the house, not just alone in the room. Based on this data, I have come to the conclusion that a dog can perform a behavior that it has been taught, even when there is no one present to command it to do so.

## **24. WILL A BLACK MOLLY SUCCESSFULLY REPRODUCE WITH A SWORDTAIL?**

Bob Mazejy, 1<sup>st</sup> block science class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague **BOT & ZOO**

Black mollies (*Poecilia sphenops*) and swordtail (*Xiphophorus hellerii*) fish are common fish sold at pet stores. They are known for giving live birth and doing so frequently. But what will both species of fish successfully reproduce? To test this theory, I bought a female black molly and a male swordtail and put them into a fifteen gallon tank. After a month the black molly showed signs of pregnancy (such as an increase in width and increase in food consumption). When she gave birth a month later, she gave birth to twenty seven babies. A few weeks after that she gave birth to sixty seven, then thirteen a week later. Two weeks later she gave birth to thirty more. The fish could successfully reproduce due to the fact that their scientific classification is similar at the Family level. Their only difference occurs in genus and species. This close relation makes them so similar that it allows them to successfully reproduce, proving my hypothesis.

## **25. BLACKJACK: A STUDY OF THE EFFECTIVENESS OF SINGLE LEVEL AND MULTI LEVEL CARD COUNTING TECHNIQUE**

Teddy Mishura, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey and Ms. Mia Dill **MATH & COMP. SCI.**

Blackjack, created in Spain around the 17<sup>th</sup> century, is the most popular card game in the world. It is also one of the few casino games that are “beatable”, meaning in this case the odds can be turned in the player’s favor, unlike many other casino games. There are two basic ways to “beat” Blackjack, single or multi-level card counting; however, which system is more effective (lucrative) is a question that card counting experts have pondered for a long time. As multi-level card counting is rumored to be more effective, I used the simplest techniques of single and multi-level card counting (Hi-Lo and Zen respectively), tested both the systems by betting a constant amount, counting using Hi-Lo or Zen, and hitting or staying depending on the count. After fifty hands for each system have been played and recorded, I converted the data into graphs using Microsoft Excel, and the results became quite clear. While using single card counting systems, I was erratically losing and gaining money (mostly losing) and while using multi-level card counting systems, I steadily gained money and lost money very infrequently. Based on these results, I have come to the conclusion that multi-level card counting techniques are much more efficient than single level techniques.

## **26. THE EFFECT OF ANTIFOULING PAINT IN THE MARINE ENVIRONMENT**

Matthew Moeller, 1<sup>ST</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague **MARINE SCIENCE**

Every spring millions of boaters across America paint on an extra layer of antifouling paint to protect their boats for the upcoming season. Antifouling paint is also known as bottom paint, it is paint that “usually contains a biocide, or toxin, held within the structure of the paint”. This paint is used to protect boats from fouling organisms such as barnacles and algae. The antifouling paints contain poisons, called biocides, which prevent organisms from adhering to the bottom of boats. Boaters have many different paints to choose from. Many boaters buy a type of paint with copper as the main biocide; this is terrible for the marine environment because the copper not only harms the fouling organisms but also all the organisms in the area where copper levels are high are also harmed. For example, a recent study shows that when there were high copper levels in the water “Cyanobacteria cell densities declined markedly 20-fold”. This means that high copper levels are killing the marine organisms in the marine environment. This project will examine the effects of common boat antifouling hull paint in the marine environment. The experimental environment closely represents the Barnegat Bay Estuary. This study included five different types of anti-fouling paints: Ablative® antifouling, Micron® with biolux, Hard Antifouling®, Teflon-based , and water-based. The effectiveness of the paint and impacts to the environment were determined.

## **27. DOES THE AMMOUNT OF INDUSTRIAL DEVELOPMENT SURROUNDING A FRESHWATER LAKE EFFECT ITS ECOLOGY?**

John Moynihan, 3<sup>rd</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague. **ENV. HEALTH**

Freshwater lakes exist in countless places around the globe and are mostly taken for granite. They are used for swimming, fishing, boating, and just a nice place to relax and enjoy nature. However any one of them could be on the brink of destruction from the pollution that is provided from industrial development. Industrial development includes roadways, construction sites, buildings, and everything that is a man made structure. This development doesn't allow excess nutrients to soak into the ground and as a result run directly into a lake and cause eutrophication. To test to the water contained within the lakes, I used a water monitoring kit on each of three lakes. This kit allowed the testing of dissolved O<sub>2</sub>, phosphate, nitrate, temperature, pH, and turbidity. I conducted my research by collecting a 50mL sample of water out of each lake. Then I conducted the tests simultaneously, on all the lakes to ensure consistent results. The testing occurred every other Saturday from December to March. My conclusion is that the pre-existing development does have an effect on the ecology of a lake. However new development and construction have a much greater effect on the stability and overall state of a lake.

## **28. ARE BINAURAL BEATS AN EFFECTIVE ALTERNATIVE TO CAFFEINATED DRINKS?**

Jan Nissen, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Kelsey and Mr. Wnek **BEHAV. HUMAN**

Every morning millions of Americans drink coffee or some other type of caffeinated beverage to "wake up" in the mornings. The caffeine in these drinks can be harmful to you as well as wake you up. An alternative to caffeine is using binaural beats. By using these beats the user can change the frequency of their brainwaves to a more awake beta state. To test the effectiveness of both of these methods a rubric was made for each and their side effects. The rubrics were scored and the side effects scores subtracted from those. The final scores were compared and it was found that binaural beats are slightly more effective when including side effects, but caffeine is much easier to obtain and use in everyday life.

## **29. IS THERE A SIGNIFICANT CORRELATION BETWEEN COLOR AND SHAPES?**

Patrick, Oehme, 1<sup>ST</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague **BEHAV. HUMAN**

Synaesthesia is a neurological condition in which correlations exist between senses. Certain types of synaesthesia are very well documented, such as grapheme color synaesthesia and auditory visual synaesthesia. However, the correlations between shapes and colors have been explored very little. By interviewing 70 subjects and entering the data into electronic spreadsheets, I was able to see if there were trends between shapes and colors. I first checked to see what color people assigned for a particular shape that was presented to them. Then, because certain colors were completely dominating certain shapes, I created additional spreadsheets to see what percentage of a color was associated with a certain shape. In almost every shape there is one color that definitely stands out from all the others. This is also true of colors showing that people did not simply just choose their favorite color. From this information I can conclude that there is a correlation between shapes and colors.

### **30. DO “GREEN CLEANSERS” SERVE AS A HEALTHIER, YET AFFECTIVE ALTERNATIVE TO CONVENTIONAL CLEANERS?**

Luke Parsons, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague **ENV. & HEALTH**

Recently, companies that sell cleaning products released a new generation of products called green cleaners. These green cleaners are composed of mostly natural ingredients, but the companies who manufacture them claim that they still clean as well as conventional cleaners. Two experiments were conducted to reveal the truth about these hybrid cleaners. In the first experiment, two stain splotch boards were sprayed by either a conventional cleaner (409 All Purpose Cleaner), or a green cleaner (Clorox Greenworks). The purpose of this was to see how many sprays it took to remove the stain for each cleaning product. In the second experiment two of the same common household plants were given 1 tsp. (n) of either Clorox Greenworks or 409 All Purpose Cleaner with their daily watering for one week. The purpose of this experiment was to see which cleaning product was healthier for the environment. The data was analyzed and showed that while the green cleanser took more sprays to eliminate the stain, it caused much less damage to the plant than the conventional cleanser.

### **31. THE GOLDEN RATIO - "IT'S A BEAUTIFUL THING!"**

Veronica Pidduck, Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague **MATH & COMP. SCI.**

Have you ever wondered why something appears unexplainably beautiful? Mathematics may be the hidden secret to its beauty. There is a way to divide a line segment such that the ratio (the “golden ratio”) of the smaller part to the larger part is the same as the ratio of the larger part to the entire segment. Leonardo DaVinci related this number to the “perfect” human body. Ancient Greek buildings were built according to this ratio, which is believed to be the most aesthetically pleasing proportion. Discoveries of the golden ratio in nature seem boundless, from spirals of shells, flowers, and hurricanes, to its existence in art, music, and astronomy. Project methodology included exploration of the mathematics and science related to the golden ratio. Field work was conducted to verify and document the golden ratio's known occurrences, along with an attempt to identify additional relationships. A survey tested the theory that the golden ratio is the most pleasing proportion

### **32. MARINE ORGANISMS ATTRACTION TO HEAT: INCANDESCENT LIGHT VS. GLOW STICKS**

John Puskas, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague **MARINE SCIENCE**

In a marine environment, it has been known that light attracts many varieties of life. From fish lights that cost up to thousands of dollars to cold reactions like bioluminescence, light has been used for both feeding and interaction, but is light the only factor? This project focused on the attraction of glow sticks and light that was conducted in Barnegat Bay, New Jersey. This experiment helped to specify whether or not a heat producing light is more effective than a simple glow stick when it comes to attracting life. Attraction was quantified and the outcome indicated that incandescent lights that produce heat attract more life than lights produced by cold reactions.

### **33. HOW FAR CAN CURIOSITY PUSH PEOPLE?**

Jessica Sansone, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Sciences (MATES),  
Advisors: Mr. Jason Kelsey and Mr. Adam Sprague. **BEHAV. HUMAN**

Secrecy is an old, well-known device in human existence. It is a way of keeping information hidden from other people due to fear of embarrassment or judgment. It is natural for a person to feel the need to keep information obscure but it is also natural to want to know what is being kept. People have a need to know things that are not public knowledge. Their curiosity drives them to want to know but how far will a person go to uncover what is unknown to them? Will a person try to ignore it and continue on with their life or will their curiosity drive them into hurting another human being to obtain the answers they seek? Are males more aggressive when uncovering the truth than females or is it the other way around? In order to determine this, six high school students were chosen with the split between males and females even at three males and three females. Each subject was presented with a secret and then their actions were observed. The results were then compiled and analyzed; females went to greater lengths to uncover a secret. This means that females are more tempted by curiosity than males.

### **34. DOES NOISE POLLUTION FROM WATERCRAFT HARM MARINE SPECIES?**

Tony Smith, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey **MARINE SCIENCE**

*Sphoeroides maculatus* is a common species of fish in the summer in Barnegat Bay and therefore because of its predatory habits is vital to the ecosystem's balance and therefore if it is being injured or harmed in anyway by anthropogenic interactions it would upset the balance and be destructive to the area. I used recordings of a jet ski and of a recreational boat and played them through speakers that surrounded the tank the subject was in. I measured response by sudden change in swim pattern, swim speed, and because it is a puffer fish, if it inflated. The "puff" is a defense mechanism that kicks in when the subject is scared or in danger. This was a perfect psychological indicator. To test physical damage I compared observations of the subject's habits before and after the test. The "after" observations were observed at periods of one minute, one hour, and 24 hours after the test. After analyzing all data I must conclude that because the subject had no observable response to the engine noise, and therefore watercraft noise pollution does not affect *Sphoeroides maculatus*.

### **35. HOW WILL INCREASED GLOBAL CLIMATE CHANGE AFFECT THE OVERALL GROWTH OF TOMATO PLANTS?**

Neha Syal, 1<sup>ST</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague **BOT & ZOO**

Global Climate Change has caused the average global surface temperature to increase by about one degree Fahrenheit; however, this slight increase has greatly altered the overall growth of some plants. Tomatoes are an important vegetable because they are a valuable crop for farmers and provide people with a source of nutrition. The optimal growing conditions of tomatoes consist of a climate where temperatures do not exceed 95°F or do not fall below 75°F. However, it is very difficult for tomatoes to grow under these optimal growing conditions because Global Climate Change is causing greater temperature variations. To determine the effects of increased temperature on growth, three trials were conducted with two separate plant boxes in each trial, one represented as "A" Box and the other represented as "B" Box. Each box contained one pot with four tomato seeds. "A" Box plants were always kept in a lower temperature than the "B" Box plants. Heights of the plants and temperatures were recorded daily. This study supports the hypothesis that increased temperatures negatively impact the growth of tomato plants.

### **36. CAN MUSIC HELP YOUR MEMORY?**

Sarah Voishnis, 4<sup>th</sup> Block Science, Marine Academy of Technology and Environmental Science (MATES), Advisor: Jason Kelsey  
**BEHAV. HUMAN**

There are few experiments and studies on how music can affect the memory. This experiment shows how vocal/ non vocal music and white noise affect a persons' short term memory. In the experiment the variables were the noise of tank filters, Apparatus by, Red Jumpsuit Atrophy and The Last to Defend, arranged by David Shaffer. These variables were chosen because they all have a similar beat per minute pattern which was approximately 60 beats per minute. The subjects took an electronic test involving the Simon memory game in which the number of sequences that were remembered was recorded in the data table. At the conclusion of the experiment the results show that non vocal music helped retain the most memory while vocal music was less and silence and white noise had the lowest.

### **37. THE FIVE SECOND RULE FACT OR FICTION?**

Samantha Will, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisors: Mr. Sprague and Mr. Kelsey  
**ENV. & HEALTH**

Many people have come to know and frequently use the so called five second rule. This "rule" states that when a piece of food falls to the ground, if it is picked up in less than five seconds, it is still considered safe to eat. I was curious to whether this "rule" was fact or fiction so I conducted an experiment using four common snacking foods, chips (Pringles), cookies (Oreos), pretzels (ShopRite), and candy (Snickers). In all of the experiments that I reviewed before conducting mine, the floors in which the food was dropped on was pre contaminated, however since I wanted to keep my experiment realistic I did not pre contaminate my floor. My results indicate that out of two trials, there were no bacteria present on the plates except the one containing a sample directly from the floor. This rejects my hypothesis that there would be no bacteria present on food, if exposed for 5 seconds.

### **38. DOES BRAIN DOMINANCE RELATE TO HAND DOMINANCE?**

Allie Zambito, Block Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Mr. Jason Kelsey  
**BEHAV. HUMAN**

The cerebral cortex is divided into two hemispheres, separating society into left and right hemisphere dominant individuals. Many people make the claim that their right-handedness is a result of their left dominant hemisphere, but does the side of the brain really have an effect on the handedness of an individual? To come to a conclusion, the "Right Brain vs. Left Brain Creativity Test" from the Art Institute of Vancouver was distributed electronically to 130 individuals from the ages of 10 to adult to identify the higher dominance percentage in either the left or right hemisphere. The left and right hemisphere percentages were broken down further into several categories, also factoring into the overall left and right percentage. Data was then analyzed and separated according to age group and gender to identify a correlation between hand and brain dominance among all surveyed individuals. A correlation was not identified between hand and brain dominance, showing no relation of brain dominance affecting handedness.

## **REVIEWS:**

### **39. ARE BARNEGAT BAY RESIDENTS TO BLAME FOR THE HIGH SEA NETTLE POPULATIONS IN THE BAY? ENV. ECO**

Tyler Bawden, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Adam Sprague and Mr. Jason Kelsey

Imagine a family goes to a beach along Barnegat Bay and the beach is closed due to the high sea nettle count. The father of this family remembers he recently laid down fertilizers on the lawn before a big rain storm. Without even thinking, the father was a contributor to the sea nettle population growths in Barnegat Bay. Sea nettle populations have always been high in the Barnegat Bay, but through the past few decades, the populations seem to have skyrocketed. The key factor that has come into play is the record sales of fertilizers being bought and used on lawns, industrial plants and golf courses around the Barnegat Bay area. Both organic and inorganic fertilizers can cause eutrophication because of the composition of organic fertilizers and the phosphates and nitrates in inorganic fertilizers.

### **40. ARE HYBRIDS CARS MORE EFFICIENT THAN CLEAN DIESEL CARS?**

Joseph Boyles, 4<sup>th</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Adam Sprague and Mrs. Mia Dill. ENV. ECO

Hybrid cars have become more popular in recent years due to environmental concerns. They are said to be more efficient and economical. However, they are not the only cars on the market to promise the same features. Clean diesel technology has made major advancements over the years as well. New diesel cars are also environmentally and cost efficient. So are hybrid cars more efficient than clean diesel cars? I decided to evaluate two cars, one hybrid (Chevrolet Tahoe) and one clean diesel (Volkswagen Touareg). To find the answer to my question I review various articles to determine which vehicle was more resourceful in three distinct areas: fuel/mileage, cost, and environment efficiency. Then, I created graphs and charts to make comparisons. After analyzing the data I concluded that the Chevrolet Tahoe had better environmental ratings while the Volkswagen Touareg cost less to purchase and maintain. In addition, the Touareg had better mileage ratings. In conclusion, I was able to determine that although hybrid cars are considered more proficient, the clean diesel scored better in two of the three categories I investigated. Therefore, hybrid cars may not be the most efficient cars on the road today.

### **41. HIGH MERCURY LEVELS IN FISH CAN BE HARMFUL TO PREGNANT AND NURSING WOMEN AND THEIR CHILDREN ENV. HEALTH**

Ashley Bromiley, 3<sup>rd</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague

Everyone has probably heard that eating fish is good for you because they contain protein and Omega-3 fatty acids. However, some commonly eaten fish such as tuna and sea bass contain high mercury levels that are said to be harmful to human health. Through further research it was found that mercury consumption can be healthy to an extent, but once consumption reaches over one part per million, overall health can be affected. The people most affected by high mercury levels are nursing women and children. Some effects of high mercury consumption are diseases and even death in rare cases. Research also was conducted about how mercury gets into fish in the first place. It was found to be caused by volcanoes and coal-burning factories that emit mercury vapors. The mercury then gets into the water and accumulates in fish. When a pregnant woman eats mercury, it can affect the developing baby through the placenta. In nursing infants, it is passed on through breast milk. This research certainly supports the hypothesis that the mercury in fish will be harmful to the consumer, regardless of the nutritional proteins and Omega-3s they contain.



## **42. CAN ALGAE BECOME A MAJOR BIOFUEL?**

Walker Davis, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Sciences (MATES),  
Advisors: Mr. Jason Kelsey and Mr. Adam Sprague **ENV. ECO**

Algae biofuels are a type of fuel derived from lipids found in unicellular algae. Algae have been looked at as a potential alternate fuel source ever since 1978, when they were considered as a solution to the energy crisis that affected America under the Carter Administration. Today, several different types of biofuels are being experimented with like ethanol and sugarcane, but algae have recently been met with much interest due to their high production rate. To determine if algae were comparable or superior to other fuels, quantitative and qualitative data was collected. Then the quantitative data was placed into graphs and tables, and the qualitative data of algae biofuels was compared to that of other biofuels. After analysis, algae were found to be superior to other fuels in the amount of fuel that can be produced per acre annually and the size of the carbon debt incurred by beginning production. These two factors are sizeable enough on their own to show that algae are a very capable biofuel.

## **43. THE BETTER BATTERY**

Courtney Dawson, 4<sup>th</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Jason Kelsey, and Ms. Kelly Zatta **ENV. ECO**

Nickel-Cadmium was the only suitable battery for many years. That was until the early 1970 when the very first non-rechargeable Lithium-Ion battery became available for commercial uses. Soon after that, the first re-chargeable Lithium-Ion battery was made. There are many uses for re-chargeable batteries, including iPods, computers, cell-phones, and several hybrid and all-electric cars and most use Lithium-Ion now. In order to see if changing to Lithium-Ion batteries is really the better choice you have to compare the two batteries in many different tests. Some of those tests include comparing energy density, voltage, and how harmful it is to the environment. After completing all tests it was proved that Lithium-Ion batteries are better for the environment because it is not hazardous waste like Nickel-Cadmium is. Also Lithium-Ion is more convenient to use because it does not have a memory effect unlike Nickel-Cadmium which does have a memory effect.

## **44. IS GLOBAL CLIMATE CHANGE REALLY ENDANGERING OUR CORAL REEFS?**

Jessica Fetterly, 3<sup>rd</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Jason Kelsey and Mr. Adam Sprague **ENV. ECO**

Global climate change has been affecting the world and its inhabitants for many years in negative ways. Our coral reefs, home to some of the most diverse life on the planet, have truly felt the blow. These reefs all over the world have been bleaching and their inhabitants have been dieing. Global climate change has been pinned for the destruction, but is it really the cause? In order to come to a conclusion, several websites explaining coral bleaching were analyzed. They described why bleaching occurs and how fragile coral reefs really are. The authors also explained how the corals can only tolerate small changes, and when they bleach, it is often related to a rise in water temperature. Over the years, the rate of coral bleaching has increased just as the concerns for global climate change has. Global climate change has been increasing temperatures in various places around the globe, and this directly correlates to rising temperatures of the sea, which causes coral bleaching. Therefore, it is clear that the global climate change is the main contributor to coral bleaching.

#### **45. A REVIEW OF THE PREVALENCE OF SYNESTHESIA**

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Advisors: Mr. Adam Sprague and Ms. Kelly Zatta **BEHAVIORAL**

Synesthesia, a cross-wiring of the nerves in the brain which causes the combinations of two or more senses simultaneously, affects many people world-wide. There are many different types of synesthesia: two examples are grapheme-number synesthesia and grapheme-color synesthesia. The objective of this review was to study and examine the prevalence rates of this condition by reviewing previously performed studies. In order to study the prevalence of synesthesia, data was collected from six different sources that focused on different aspects of synesthesia. The reviewed experiments reported familial patterns, specific types and percentages of synesthesia, and sex bias. The results concluded that the female to male ratio of synesthetes is approximately 6:1, about forty percent of synesthetes have at least one relative with synesthesia, and there is no direct correlation between synesthesia and IQ testing. The world-wide prevalence between synesthesia is approximately between 1.4% and 4.0%.

#### **46. OFF ROAD RIDING: CHANGING THE NEGATIVE IMPACT ON LAND THROUGH EDUCATION**

Emily Golembiski, 1st Block Science Class, Marine Academy of Technology and Environmental Science  
(MATES), Advisor: Mr. Adam Sprague **BEHAVIORAL**

Illegal off-road vehicle (ORV) riding is ruining 300,000 acres of state land each year in New Jersey. Although off-road riding is considered dangerous to the land and the people involved, it is a very popular sport in the state. Education is a huge key factor to improving the sport for everyone by teaching the riders how to act considerably towards the land and other people in the area. Natural off-road parks, like in Chatsworth, New Jersey, can also help the environment by taking the state's polluted, dumped on land, cleaning it up, utilizing it for a set period of time, and then giving it back to the state in a far better condition than when it was given. It has been said countless times to the ORV users of New Jersey that a park will be provided soon, but so far no real proof has been shown. The off-road riding group as a whole has earned a bad reputation over the years because of a couple irresponsible riders who cause trouble. If Off-road riders had a safe and monitored place to ride with an education on how to treat the land, they would cause less damage to the land. Off road riders could also be given contaminated land and actually improve environmental conditions on selected areas of land.

#### **47. IS THE EQUINE HYDROTHERAPY TANK AN EFFECTIVE METHOD OF REHABILITATION?**

Ethan Gorsak, 4<sup>th</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague **ENV. HEALTH**

The equine hydrotherapy spa is used as a method of rehabilitation for leg injuries in horses. There has been speculation on the effects it has on these leg injuries and whether it actually works. The results of the treatment from the research conducted showed many positive outcomes can occur when using the hydrotherapy tank. Horses that had no chance of recovery recovered from there injuries. They even were able to return to training and competing. Out of the twenty seven horses analyzed in one study, only two horses did not make complete recoveries and return to training. There has been much success with the hydrotherapy tank at High Pointe Equine Center in New Jersey. My reining horse underwent treatment with the hydrotherapy tank at the facility and was able to return to competing at a high level after it was deemed that he would never compete again. With the results found from the conducted research and the results from my experience, I conclude that the equine hydrotherapy tank is an effective method when choosing a course of rehabilitation.

#### **48. OVERUSE INJURY: A MUSCIAN'S CAREER KILLER**

Logan Hannen, 3<sup>rd</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey

**BEHAVIORAL**

A musician's hands are his or her most important asset. Certain hand postures, such as the postures of a guitarist's picking hand, facilitate certain musical patterns while inhibiting others. These postures often lead to injuries of the hand, wrist, or arm. By definition overuse injury is a painful condition usually of the hands and wrists produced by hard, continuous use of the upper limb that is devastating for the individuals affected. It is common knowledge that music affects people in some way shape and form. If this is a career killing disease, then the question must be asked; what would the world be like without music? Therefore, if there was a threat to a musician's career, it must be necessary to be aware of how to prevent such injury from happening. Studies have been conducted in order to prove just how certain styles of playing certain types of instruments affect the musician. Data collected from these studies has been organized and it has been determined that there is a direct correlation between certain styles of playing and the injuries that can be endured.

#### **49. LONG-TERM EFFECTS OF MAJOR OIL SPILLS**

Matt Maroukis, 3<sup>rd</sup> Block Chemistry, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Adam Sprague

**ENV. ECO**

As you probably know, an oil spill occurs when large quantities of oil disperse into, and pollute the surrounding ecosystems. This is caused by a combination of carelessness and poor preparation. The pollution of the ecosystem greatly affects the wildlife in the nearby waters and shores; it causes many long-term effects. I investigated research describing these effects and constructed a review of how damaging these spills can truly be. Although every oil spill has different variables, the one thing they all have in common is that they leave the biggest impact on low-energy environments. It causes so much damage to these types of environments because they are so densely populated with a variety of species. The species that are most affected in the majority of spills are marine birds, following with marine mammals, mollusks, and as surprising as it may be fish are affected least. The effects are caused by deadly chemicals in the oil called hydrocarbons. The toxic hydrocarbons in oil can enter the bloodstream of animals that come in contact with it and damages red blood cells. Hydrocarbons also suppress immune systems, affect liver, spleen, and kidneys. They even interfere with the reproductive system function.

#### **50. EFFECTS AND PREVALENCE OF SEASONAL AFFECTIVE DISORDER ON HUMANS**

Stephen Mershon, 1<sup>st</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES)  
Advisor: Mr. Adam Sprague

**BEHAVIORAL**

Each year, millions of people in the United States are affected by Seasonal Affective Disorder (SAD). Seasonal Affective Disorder is a recurrent mood disorder associated with depression and fatigue. Seasonal Affective Disorder usually occurs during the same time period year after year. Research on the effects, typical symptoms, and epidemiology of Seasonal Affective Disorder was collected first. Then, two individual research studies and a third study based off of a survey were used to find the average prevalence of Seasonal Affective Disorder, along with the average age and sex of people diagnosed with SAD. Research was once again collected, this time on possible treatments and awareness programs for Seasonal Affective Disorder. Finally, all of the research was compiled together to form a final set of conclusions. This study showed that many people are affected by Seasonal Affective Disorder, and that the likeliness of becoming susceptible to Seasonal Affective Disorder is usually dependent upon different factors, such as age and sex.

### **51. IS THE 2009 H1N1 INFLUENZA THE DEADLY DISEASE THE MEDIA PORTRAYS IT TO BE?**

Ben Mrozinski, 3<sup>rd</sup> Block Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey **ENV. HEALTH**

The topic of the 2009 h1n1 influenza has brought on some disagreements between media officials, doctors, and the public. While most people think that this “new” strain of flu is deadly and will have a devastating outcome on society, it really is not. This virus has a rather low mortality rate, along with the added precautions taken on by the people of the world who have enough information to do so; therefore, the amount of people that will become sick will be rather low also. Also, concurring with this hypothesis, is the information gathered from the WHO and the CDC, which shows that the death tolls and mortality rates are much lower for h1n1 than the seasonal flu.

### **52. SMOKING VS. DRINKING – IS ONE REALLY WORSE THAN THE OTHER?**

John Murray, 2<sup>nd</sup> Block Science Class, Marine Academy of Technology and Environmental Sciences (MATES),  
Advisors: Mr. Adam Sprague **BEHAVIORAL**

Although it is known that Tobacco and Alcohol are not good for our health and well being, 155 million people in the USA use one or both. Each year over \$520,000 people are killed directly and indirectly as a result of tobacco and alcohol. The purpose of the project is to identify which is the worst of the two evils. The use of alcohol dates back to the Celts, Ancient Greeks, the Norse, Egyptians and Babylonians as far back as 10,000 year ago or 8000 BC. The use of tobacco dates back to the 15<sup>th</sup> and 16<sup>th</sup> centuries originating from the Americas. According to the Center for Disease Control and Prevention (CDCP), 46.2 million adults were smokers in 2001 (the most recent year for which numbers were available) or, 22.8% of all adults. Also, 109 million people or 48.3% (adult and children over the age of 12) have reported drinking alcohol. Of the 520,000 people killed each year as a result of tobacco and alcohol use, tobacco is responsible for 435,000 deaths compared to that of 85,000 related or 84%. It is obvious that the use of tobacco far outweighs the use of alcohol. In fact, the research showed that the number of deaths related to tobacco is outweighs the number of deaths related to alcohol, car accidents, suicides, AIDS, homicides and illegal drugs combined.

### **53. THE EFFECTS OF OBESITY ON LIFE EXPECTANCY**

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Obesity, an ongoing epidemic in today’s modern world, is a “condition of excess body fat that results from a sustained energy imbalance in which intake exceeds expenditure.” Research was conducted on the multiple facets of obesity in order to determine if being obese as a child, and having obesity in lineage can have adequate effects on a person’s life expectancy. Topics addressed were childhood obesity, diabetes, the effect of obesity on life expectancy and quality of life, diseases caused by obesity, and other contributors. This wide variety of research was organized and brought together in order to draw sufficient conclusions with regards to the objective of this study. The conclusions indicate that obesity could cut about 12 years off your life expectancy, and coupled with smoking, almost 21 years. Obesity as a child further decreases your life span, and inheriting these health complications increases your likelihood to develop health problems in the future and can increase your probability of becoming overweight or obese. The affects of obesity on you are also inversely proportional to the affects on your wallet. Medical treatment correlated with obesity, such as bypass surgery, amputations, organ transplants, and diabetes treatments and pills all cost exorbitant prices. It could be concluded that being obese as a child and having obesity in your gene pool has a negative effect on life expectancy.

#### **54. PLASTIC WATER BOTTLES: NOT THE BEST OPTION**

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**ENV. HEALTH**

Within the last decades, consumers have been increasing their use of plastic water bottles. However, just because the bottles are convenient does not mean that they are safe. Research has shown that they are hazardous to both one's health and the environment. For example, they may be subject to insufficient mineral amounts, bad packaging, or be filled with water that is less safe than tap water. Also, their production damages wetlands as companies are draining large amounts of water. Many believe that the most dangerous threat of plastic water bottles is the bisphenol-A (BPA) from the bottle that leaches into the water. Studies have put the bottles in ordinary conditions that they experience through consumer use and found that the BPA levels increase with time and temperature. This is extremely important to research because BPA can cause cancers, neurological problems, or interfere with natural hormones in the body. It has been concluded that stainless steel water bottles filled with tap water are safer for both health and the environment.

#### **55. FECAL COLIFORMS IN LAKE WATER**

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**ENV. HEALTH**

Fecal coliforms are bacteria that inhabit lakes, and indicate the presence of other bacteria harmful to humans. In order to preserve public safety, lake water is sampled regularly, and the samples are brought to a lab where they are analyzed to see how many fecal coliforms are contained in 100 mL of water, by filtering the bacteria out of the water, incubating it, and counting the number of colonies. The findings are reported to the town they originated from, and posted on a county website. The data was printed and graphed in order to draw conclusions as to whether or not fecal coliform levels in Ocean County lakes indicate that they should be avoided by swimmers. The amount of samples with a suitable number of fecal coliforms in accordance with state regulations was compared to the number of samples that exceeded given parameters. These conclusions were then compared to those made in other parts of the country, such as Lake Michigan. It showed that although the levels of fecal coliforms may indicate that lakes should be avoided in other regions, their presence is not significant enough in this area to warrant the permanent exclusion of lakes as a source of recreation.

#### **56. THERMOGERULATORY ASPECTS OF BEARDED DRAGONS**

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**ENV. ECO**

Thermoregulation is a trait found in many animals. Reptiles, birds and mammals all use this to regulate their body temperature, or  $T_b$ . The temperature of an animal's surroundings directly affects everything from the development of an animal to its daily behaviors. Researching thermoregulation may benefit many species by providing a means of tracking the effects of global climate changes. The sex ratio in a given population of various reptiles is temperature dependant. Looking at population and gender trends over several years could help to determine and track the rise and fall of seasonal temperatures in the given region. *Pogona vitticeps*, the inland bearded dragon, is an excellent example of a species where thermoregulation is involved in nearly every aspect of their lives. Inland bearded dragons require thermoregulation to survive fluctuations in their environment and have evolved several ways to do this successfully.

## **57. ARE HUMANS AFFECTED BY PESTICIDES SIMILAR TO HERMAPHRODISM IN FROGS?**

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Hermaphrodisism in frogs has always been a concern ever since the use of DDT, but it lowered after the pesticide was banned. Unfortunately the rates have increased and the effects are more noticeable as more physical deformations have been found in contrary to the unnoticed sexual deformations of the original DDT sprayings. There are some less known proposed effects of pesticides on humans, but the public is generally unaware. However, should these theories be taken seriously, is there any truth to them, and are the frogs a warning for what will happen to us? Every statement has a reason behind it, so to prove its significance; I collected data on testosterone levels, hermaphrodisism rates in frogs, and males with low testosterone. The data was surprising as it was very specific and several studies had been done on the subjects, just never in conjunction. The testosterone level of average males has been steadily decreasing over the past few years while the hermaphroditic frogs kept increasing. When the modern day results were compared to the results of the late 70's, it showed a similar trend in both frog rates and testosterone levels. There is even a law that any farm using pesticides must warn its workers and nearby residents because of its dangers and side effects. Therefore, I have come to the conclusion that humans are affected by pesticides in a similar way to frogs, but not to the same degree.

## **58. WHAT IS THE WORST TYPE OF POLLUTION IN THE OCEANS AND WHY?**

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Our planet's oceans are one of the largest contributing factors to the function of the world for many reasons. Among these include the creation of jobs, the supply of food and they are still major trade routes. Pollution, which is the release of undesirable chemicals into the environment, is threatening the purity of the waters. Over polluting can lead to a decline in value, and even life, in the oceans. For quite some time, people have argued over what the worst pollution in the oceans are and why; and that is what I plan to figure out. Through my research, I have found the worst type of ocean pollution to be oil spills and oil runoff. I have come to this conclusion after taking into account, the long and short term effects of each separate form of pollution, which I found and classified under four main categories. I weighed the effects of each category and then came to my conclusion that oil is the most dominant, and by far, the worst pollutant in the oceans.

## **59. CLEAN COAL: FACT OR FICTION?**

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Advisor: Mr. Jason Kelsey **ENV. ECO**

Coal is the most abundant fossil fuel in the country, and we use it for much of our energy, especially electricity. However, there are environmental problems associated with burning coal, including carbon pollution, which is heavily associated with global warming. To solve this problem, researchers have been investigating new ways to burn coal; clean coal technologies. But is a clean coal plant really cleaner? Is it worth the time and money? To find out, I researched 3 main factors that would contribute to the overall feasibility of this technology; efficiency, cost, and 'green'-ness. The efficiency is generally higher than traditional coal plants, but these plants are far from cheap. The extra cost would be in the billions. As far as environmental friendliness, they are able to reduce the carbon emissions by up to 90%, but the process would pollute the water and earth around the plant. Also, the technology would only work on a very small scale; if a clean coal plant were the size of a traditional one, the emissions would only be slightly less. Based on this and other research, I have come to the conclusion that no, clean coal is not practical. But since we shouldn't continue polluting the environment, the best alternative would be to look into different, cleaner energy, such as wind and solar.

## **60. BEHIND THE WHEEL: DRUNK DRIVING VS. DROWSY DRIVING**

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Car accidents are a serious matter. The problem with these accidents is that they are causing more and more deaths annually. This research will evaluate the differences and compare the dangers of both drunken driving (DWI) and fatigued driving (A form of impaired driving). This will be helpful in a way that the research will show how simple things as drinking or even just being drowsy can seriously put one's life at risk. To conclude this research, my approach will be to evaluate and analyze scholarly articles throughout the internet in order to conclude whether DWI is more dangerous than driving while fatigued, or vice versa. Throughout researching and evaluating multiple sources, it can be concluded that drunken driving is more dangerous than fatigued driving due to the higher amount of deaths it causes annually. It's even proven that over fifty percent of license-suspended drunk drivers continue to drive, so they are still on the roads causing potential danger. Overall, this research proves that drunken driving is more dangerous than drowsy driving, even though both are serious dangers on the road.

## **61. HOW BIG ARE YOU ECOLOGICAL FOOTPRINTS?**

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Ecological footprints help tell how much someone is impacting the environment. Dr. William Rees and Mathis Wackernagel invented the concept. Ecological footprints are calculated by adding many concepts into a survey, such as food intake, housing, etc. Then the survey tells how much land everyone on Earth would need if they lived that person's lifestyle. Humans are harming the environment by wasting energy, food, and land. This is causing polar ice caps to melt, which causes polar bears and penguins to lose their homes and die. People took a footprint survey on [www.myfootprint.org](http://www.myfootprint.org) and gave their results. The results were then compiled and compared to each other, the United States, and Canada. The average number of Earths the participants would need is 5.13 Earths. Therefore, society must be educated about ecological footprints and their actions in order to live an environmental conscious lifestyle and help the environment.

## **62. THE EFFECTS OF SECOND-HAND SMOKE ON CHILDREN**

Rosie Wenrich, 4<sup>th</sup> Block Chemistry Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey **ENV. HEALTH**

Helpless infants and children are forced to inhale poisonous toxins everyday with no way to escape; the toxins are coming straight from their own parents' cigarettes. Second hand smoke, which can also be called passive smoke or environmental tobacco smoke, is the smoke that the end of a cigarette gives off and the smoke that smokers exhale. Second hand smoke contains more than 4,000 substances, many of which are known to cause cancer. Passive smoke can cause severe asthma, middle ear infections, pneumonia, Sudden Infant Death Syndrome, and bronchitis in children. Smoking in households needs to be banned to protect children from these life threatening illnesses.

### **63. CARBON SEQUESTRATION: OLD GROWTH FORESTS VS. GROWTH FORESTS**

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Trees play a big role in the quality of the environment, such as offsetting greenhouse gases and preventing many of the negative effects on nature and society that may result from the greenhouse effect. Recent scientific evidence also shows that the levels of greenhouse gas emissions, one of which is carbon dioxide, are significantly high. For this reason, many organizations have been putting out an effort to protect old growth forests worldwide, but are these methods truly that beneficial? To come to conclusions, data on the total amount of CO<sub>2</sub> stored per tree at given ages for four tree species was collected from a software program called the “Tree Carbon Calculator” which was developed from the Center for Urban Forest Research. After using graphs to analyze the data, it was found that trees do sequester carbon at a faster rate as they grow at a faster pace and that once trees reach maturity, no additional carbon continues to be stored. Therefore, replacing old growth forests with new growth forests is more efficient in carbon sequestration and reducing greenhouse gas levels than preserving and protecting the old growth forests.