

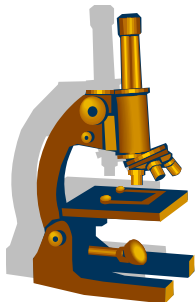
# Marine Academy of Technology & Environmental Science



## Fifth Annual Freshman Research Showcase

Abstract Guide

April 13, 2011



April 11, 2011

**It is hard to believe that this is our fifth year of the MATES Freshman Research Expo! This was a great year for student research. All freshmen were required to conduct an independent experiment. Once completed, the students completed a poster culminating in the poster session on April 13, 2011. Many hours went into the projects as all 64 freshmen will be presenting their posters and they will be displayed in alphabetical order of their last name; however, they will be judged depending on their category.**

**We would like to thank the Class of 2014 for an outstanding project presentation this year. 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. David Werner, Mr. Jason Kelsey, Ms. Maryann Minnier, Ms. Mia Dill, and Ms. Kelly Zatta who served as mentors and editors to our students for their projects. Also, thanks to Ms. Debrah Koehler, Ms. Ester Gallacchio, Mr. Matt Adkins, Mr. Gino DiGiovanni, and Mr. Roman Khariv for all of their support and assistance.**

**Thanks to the parents who have contributed much time and effort in making the projects possible. Without their support, this research would not be possible. And, last, but not least, a special thanks to all of our judges who volunteer to provide our students with constructive feedback about their projects. We greatly appreciate your time and expertise in making the 2011 MATES Freshman Research Expo a real success.**

**The categories are listed on the next page, with the students listed in each and their presentation poster number. Congratulations to all of the students listed, and good luck during the judging and public display sessions.**

Sincerely,

*John P. Wnek*

**John Wnek, supervisor,  
Science and Research**

## 2011 Freshman Research Expo (Categories)

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25 - Arianna Grace  
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52- Greg Resch  
56 – Natalia Stifano  
59 – Danny Torri

### Botany

3- Jenevieve Ball  
15 – James Dimmick  
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40- Lindsey Mahnken  
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### Physical Sci. & Engineering

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### Behavioral & Social Science (Senses)

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## **1. WHICH ADHESIVE BANDAGE OFFERS THE BEST COMBINATION OF PERFORMANCE AND PRICE?**

Rachael Allan, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner **Health & Medicine**

Adhesive bandages come in many different brands and types, all with slightly different nuances. Pricing, however, is a major factor in considering which adhesive bandage is best for the consumer's needs. It was theorized that the higher the price, the better adhesive qualities are present. Three test subjects wore various bandages on their arms until they fell off naturally; times were documented. Additionally, these bandages were tested by being submerged in salt and tap water. Data was recorded in the form of bar graphs and charts. Analysis of this data was used to determine performance versus cost per bandage. The hypothesis was proven correct that the most expensive adhesive bandage, Band-Aid Sports Strip®, did indeed last the longest. The average consumer does not need the bandage to last as long as the most expensive did, and using a lesser expensive bandage provided sufficient results. Band-Aid Water Block Plus Clear®, Nexcare Comfort Fabric®, and Curad Flex-Fabric® adhesive bandages are all good alternatives at a more reasonable price.

## **2. THE BACTERIA BUILD-UP ON YOUR TOOTHBRUSH**

Chelsea Aure, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. David Werner and Dr. John Wnek **Health & Medicine**

Toothbrushes play an important role in maintaining good oral hygiene. Many people brush their teeth everyday to prevent bacterial diseases, yet there are hardly any people who pay attention to what temperature they use to rinse their toothbrush in. Does the temperature of water used to rinse your toothbrush with affect the bacterial growth on the bristles of the toothbrush? To draw conclusions to this research question, several tests were taken in attempting to figure out whether if hot or cold water inhibits the growth of bacteria on the toothbrush. Two people brushed their teeth for approximately 2 minutes and rinsed their own toothbrushes under a certain temperature of water. A sterile cotton swab was then used to take a sample of the bacteria on the bristles. The Petri dishes of bacteria were cultivated and the results from each sample were tabulated and analyzed. The data showed that hot water inhibits the growth of bacteria on the toothbrush, and that dental bacteria grow the most in under a certain range of temperature. Although this is the data as a result of this experiment, it is not necessarily recommended by dental experts, for hot water can wear down the bristles more quickly than colder water.

## **3. IF THE GRASS GROWS GREENER ON THE OTHER SIDE, THEN THEY MUST BE WATERING IT IN THE MORNING**

Jenevieve Ball, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner **Botany**

A common debate in our society is "What time is the best to water grass?" The quest for a solid answer to this question began soon after that question was presented. The most beneficial time of day to water grass was determined through this experiment. In a controlled, indoor environment, nine small pots of grass were grown with the only variable being the time of day each pot was watered. Three groups were created, one watered in the early morning, the next watered in the afternoon, and the last watered in the evening. The overall growth, fungal growth, and amount of sprouts were recorded and analyzed. These results determined that in the morning hours is the best time for grass watering. The highest growth was shown in this group, as well as the most and quickest appearing sprouts, and the lowest of all fungal growth. Pots watered in the afternoon showed the least amount of growth and sprouting, and fungal growth was more numerous in the pots watered at night. Therefore, morning is the more opportune time to water grass.

#### **4. GROWTH OF *E. COLI* IN DIFFERENT TYPES OF MEAT**

Joseph Barbitto, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Dr. John Wnek, Miss Zatta Kelly, and Mr. Adam Sprague **Health & Medicine**

*Escherichia coli* are very common bacteria in organisms' digestive tracks and are often the subject of sensational news coverage for its ability to poison consumers. When an incident in Taco Bell several years ago concerning this terror bacteria on spinach, *E. coli*, it sent Taco Bell customers into frenzies over their health. While *E. coli* is found in the digestive track of most organisms, when ingested, it is very dangerous. The food packaging industry has taken numerous steps to ensure that its customers will never encounter these bacteria in its meat, but unsanitary kitchen conditions can lead to it making its way to a person's mouth. This study suggests that certain meats are more prone to *E. coli* growth by placing samples of an *E. coli* culture on beef, bologna, chicken, and chicken loaf, and letting colonies form on the meat's surface. Food-borne illnesses are usually the cause of improper meat handling, and learning how to properly handle and prepare meat will be one of the first steps to better understanding of microbiological threats and keeping people healthy.

#### **5. MEASURING ENERGIES OF LIGHT USING PHOTOVOLTAIC PANELS**

Shawn Barry, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey **Physical Sci. & Engineering**

The spectrum of visible light includes a broad range of colors from purple to red, with all of the colors in between. Each of these colors has a different wavelength which gives each of them different characteristics, like hue. All of these colored wavelengths of light are contained in white light, which is emitted by light sources like the sun. The purpose of these trials is to determine the most energetic wavelength in white light using a photovoltaic module attached to a multimeter. The module was exposed to sunlight filtered through various colored cellophanes to gain a reading of the voltage produced. After following this procedure, it was found that of the colors – purple, blue, green, yellow, orange, and red – yellow contributed the most power to white light based on quantitative analysis of the multimeter data, followed by orange and blue light.

#### **6. DIFFERENCES OF IN-SHOE PLANTAR PRESSURE IN DIFFERENT TYPES OF SHOES WHILE RUNNING LONG DISTANCES**

Emily Beyer, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey **Health & Medicine**

Running is a sport that many people take part in to stay in shape. This sport ranges from leisurely running, to training, to racing. Different shoes are used for different types of running. Training shoes are used for leisurely running and training, while racing flats are used in races. But what would happen if racing flats were used during a leisurely run? Would they exert a lot more pressure on the feet? This study was conducted to answer these questions. To find the amount of pressure on the feet, foot pads were inserted into racing flats and training shoes. The same distance was run in bot shoes by the three people. The results indicated that more pressure was exerted on the feet while they were running in the racing flat. Racing flats have thinner soles than training shoes which could have been part of the difference. The thick sole of a training shoe absorbs more of the shock before being exerted on the feet. These results can help with proper shoe selection to help prevent foot injuries.

## **7. DOES POLLUTION EFFECT NITRATE LEVELS IN THE OCEAN?**

Tyler Bulin, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Mr. Jason Kelsey

**Environmental Science**

The research conducted was to test whether beach pollution and surrounding development had an impact on the nitrate levels of the water. Nitrates ( $\text{NO}_3$ ) are chemicals commonly found in septic wastewater, fertilizers, decomposed organic matter, and atmospheric nitrogen that are transformed to nitrate by bacteria found in sediment. It is one of the only two forms of nitrogen that plants can take in. The test was conducted using 3 four gallon Sterilite® containers, each with around 3.5 gallons of water from the bay, and a different soil sample. Starting in November every 2 weeks the water was tested for nitrates, along with some things like temperature, salinity in order to decrease the chance of organisms within it from dying. The data supported my hypothesis that the tank with the sediment from the worst kept beach would have the lowest nitrate levels.

## **8. ARE GREEN PRODUCTS TRULY GREEN?**

David Calvert, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Mr. Jason Kelsey

**Environmental Science**

Daily house cleaning requires a little more than soap and water, which is where household cleaners come into play. Many people are unaware that even the products labeled “green” are harmful to the environment. People often pour used cleaners down storm drains to be rid of the chemicals. But the effects are elevated now that they are heading towards local rivers, streams, and estuaries where hundreds of different organisms thrive. The diverse species in those locations are sensitive to chemicals. The toxicity of the “green” products was tested as compared to an unharmed group of shore shrimp (*Palaemonetes sp.*) and a group of shore shrimp whose tank was mixed with bleach. Each time a shrimp died in each of the tank systems it was recorded and added to the collective data. The results indicated that the green works products proved harmful to the species it was being tested on. If this species were to be exposed to a small dose of this chemical in their natural environment then the chances of that species surviving the toxic chemical are slim to none. The effects on human health are very few, unless the chemicals destroy a food chain including the shore shrimp, killing off some of the species of fish used in consumption.

## **9. HOW DOES RAIN AFFECT THE AMOUNT OF BACTERIA IN LAKES?**

Kim Carter, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Mr. David Werner

**Environmental Science**

Most forms of Coliform bacteria are harmless to humans; however, some fecal Coliform bacteria may cause intestinal distress and in more severe cases nausea, vomiting and even death. Fecal Coliform bacteria is found in the intestinal tracts of warm blooded animals. The purpose of this experiment was to determine whether rainfall had an effect on the amount of bacteria in Lacey Township Lakes, New Jersey. My hypothesis is that after rainfall, the bacteria levels should be higher. For this experiment, water samples were collected before and after it rained. Water was also tested in front of the storm drain to determine whether or not the bacteria was from storm runoff. The results suggested that there were higher bacteria levels in front of the drain after it rained and the samples from open water showed little change.

## 10. DOES ARTIFICIAL LIGHTING AFFECT HERMIT CRAB BEHAVIOR?

Dominic Chiarello, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner Zoology (Animal Behav.)

When an organism is nocturnal, it is an organism that is primarily active in the dark. The Land Hermit Crab, *Coenobita clypeatus*, is also considered a 'nocturnal' creature. This means that the sun's rays affect the crabs' behavior. But does this also mean that artificial light also affect the behavior of hermit crabs? This experiment tested the effect artificial lighting has on the Land Hermit Crab (*Coenobita clypeatus*). To get an answer, two hermit crabs were put in a controlled environment where lighting was the variable. Using light bulbs of different voltages, the lighting was changed. The food intake, water intake, movement, and interaction of the crabs were all observed. The data was then analyzed and it was shown that artificial lighting does have an effect on the behavior of Land Hermit Crabs (*Coenobita clypeatus*). When there was no lighting, the hermit crabs were the most active. As opposed to the crabs being the least active in the brightest level of lighting. This means that artificial lighting plays the same role in the Land Hermit Crabs' (*Coenobita clypeatus*) lives as the sun's natural rays do.

## 11. HOW DO SALTS USED TO MELT ICE AFFECT THE COMMON SHORE SHRIMP (*Palaemonetes spp.*)?

Thomas Chu, Block I Science Class, Marine Academy of Technology and Environmental Science (MATES)  
Advisors: Mr. David Werner and Dr. John Wnek Zoology

Snow storms are a nuisance to commuters everywhere. To counter the buildup of ice and snow on roads, the state spreads various ice-melting salts on the roads and sidewalks. It lowers the freezing point of water, and melts the ice. As this occurs, the salt is dissolved and flows away with the water. The water runs off, and eventually finds its way to large bodies of water, but what happens when the salty water reaches the bodies of water? This experiment was conducted to find out how various concentrations of salts commonly used on streets and sidewalks will affect common shore shrimp, *Palaemonetes spp.*, taken from Barnegat Bay. One hundred shrimp were placed in gallon Rubbermaid buckets with a mesh wire on top. There was a control test with ten shrimp in plain bay water. The remaining ninety were divided into three groups, one to test rock salt (NaCl), one to test a rock salt/calcium chloride (CaCl<sub>2</sub>) blend, and one to test an increased amount of sea salt. The salts were mixed with bay water at added concentrations of five, ten, and twenty parts per thousand (ppt). It was determined that the CaCl<sub>2</sub> blend caused the highest mortality rate.

## 12. BILINGUAL DOGS?

Shane Church, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner Zoology(Animal Behav.)

The saying "You can't teach an old dog new tricks" has been a statement made for years, but can you teach a dog a new language and have them retain it? Language is not something inherited but learned. The speaker of a language affects how the language is learned. So if the owner is speaking then the dogs will listen. This experiment involved two dogs, one male and one female both of which had only been spoken to in English. The dogs were spoken the same commands that they knew in English, sit stay and eat, in Spanish. After two months of being taught Spanish they were spoken to only in English for one month to see if they would forget the new language. After that month the Spanish commands were spoken to them again to see if the language had been retained. The dogs remembered the commands sentarse (sit), and estancia (stay); however, the dogs forgot the command come (eat). This was most likely due to the fact that come and come sound very similar so the dogs would have gotten confused. The Dogs had retained two thirds of the Spanish Commands that had been taught to them.

### **13. BOAT WIRE: DOES IT MIX WITH SALT WATER?**

Christopher Coon, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey **Physical Sci. & Engineering**

Efficiency of wire is extremely important where ever it is used. Efficiency is a measure of the amount of work out in to the amount of work put out. An efficient machine will give off little heat and will show almost 100% of the energy put in represented in the output energy. Unfortunately in current physics a 100% efficient machine is considered impossible due to friction in the case of marine wire resistance. Resistance is cause by conduction electrons hitting electrons attached to atoms in the wire converting a very small amount of electricity to heat. Then by the amount of heat a wire gives off a rough estimate of how efficient the wire is can be determined. The heat being given off not only shows inefficiency, but can be a hazard as it can cause fires in the environment if the wire. This experiment explored the idea of reusing wire that had been exposed to salt water (32 ppt) and measuring the efficiency and safety of the exposed wire. This simulated if wire in a boat was submerged after four weeks. The results indicated that it was possible to reuse the wire safely and efficiently after four weeks of wire being submerged. The experiment tested 12, 14, and 18 AWG wire running from a battery to a bilge pump. The results showed that while there were slight variations they were negligible enough not to have adverse effects by using the wire on a boat for certain applications. This goes against the current recommendations of safety commissions on reusing the wire after it had been submerged.

### **14. THE EFFECTS OF AGE ON THE TASTE BUDS**

Audra Didzbalis, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner **Behavioral & Social Science**

A single taste bud contains cells that are sensitive to four taste categories: salty, sweet, sour, and bitter. Many people argue that as people age, sensitivity to taste decreases, but does taste perception really have anything to do with an individual's age? To find the answer, participants with ages ranging from five to eighty were asked to identify one of the four taste groups according to what extra ingredient was added to their water. The percentages were calculated and broken down according to the accuracy of each age group, and the accuracy of each age group and each of the four taste categories. Data was then analyzed to find a correlation between age and the accuracy of the taste buds. A connection was found in age and taste perception, showing that as we age, taste accuracy does decrease significantly.

### **15. THE EFFECTS OF COLORED LIGHT ON PLANT GROWTH**

James Dimmick, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. David Werner and Dr. John Wnek **Botany**

According to Richard Hoyt, plants need different wavelengths of light to grow at different stages of their development. Blue light is needed for “the growth of stems, stalks, and leaves. Germinating seeds, seedlings, and transplants” also need blue light (Hoyt). “Red light is needed for flowering and production of fruit” (Hoyt). This experiment was intended to determine how different colors of light affect plant growth. It was based on the fact that plants grow through photosynthesis, which is fueled by light. Each tray was planted with ½ tsp of perennial rye grass seed. The completed trays were each placed in a separate cardboard box with one of eight colored lights inside, watered at regular intervals, and the height (in centimeters) of the tallest blade of grass in each tray was recorded daily. All growth rate efficiencies were measured in relation to a standard white light bulb that served as the experiment's control. The results indicated that some specimens reacted better to their controlled environments than others, either in size or in less time. This experiment is important because it can be applied to greenhouses and projects that benefit from maximized growth.



## **16. DISSOLVED OXYGEN IN THE LITTLE EGG INLET**

Rebecca Dixon, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner

**Marine Science**

Numerous people that fish often do not wonder why there aren't fish sometimes in certain areas of the ocean. There may be many reasons why fish are not located in certain locations for example, the lack of food, too many predators, or loss of habitat. Some other reasons involve the presence or absence of necessary water quality parameters. One such is the lack of dissolved oxygen. Dissolved oxygen is the amount of oxygen that has been dissolved within the molecules of water. Fish and other aquatic life use this dissolved oxygen as a form of respiration. In this experiment, dissolved oxygen was tested to find if there was a difference in its levels at incoming versus outgoing tidal stages. A LaMotte Dissolved Oxygen Test Kit® (ppm) was used in order to determine the amount of dissolved oxygen in the water. The water was tested directly inside the Little Egg Harbor Inlet, near the Rutgers Marine Station. The water was tested every Sunday for the month of November, at three different depths including 1 m, 3 m, and 6 m. The results of this study indicated that there was no significant difference in dissolved oxygen among tidal stages at the same depths. However, there was significance in dissolved oxygen values between depths.

## **17. CORAL CRISIS: HOW DOES CLIMATE CHANGE AFFECT CORAL?**

Jeremy Doll, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Dr. John Wnek and Mr. David Werner

**Marine Science**

Global climate change has become a pertinent issue in the past few years and is said to be the cause of many negative things. One of the things it has been accused of is destroying natural beauties, coral reefs in particular. Corals are tiny organisms that are polyps with symbiotic zooxanthallae algae living inside them. They are very sensitive to the condition of their environment, water quality and temperature being two major factors. Variations in either can kill the symbiotic zooxanthallae and cause the corals to die. My tests used a hardy coral commonly known as mushroom coral, or *Discosoma sp.* Two were placed in their own 5-gallon experimental tanks and the other in a 90 gallon base tank. Temperature and lowering of pH were tested in the experiment tanks. The temperature change caused the coral to deteriorate in health and bleach. While the pH test proved unsuccessful, evidence shows that it will cause coral bleaching as well.

## **18. FOOD COLOR AND TASTE PERCEPTION**

Monica Douglas, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner

**Behavioral & Social Science**

Perceived taste and flavor can be influenced by visual appearances such as color. Flavor can be defined as the sensations recognized while tasting a substance. These sensations may include smell and overall taste of food. However, the first impression of a food substance is the appearance, with the consumer recognizing color first. Certain colors may be associated with a certain flavor, as yellow is thought to represent lemon. Food substances may be colored with artificial coloring to deceive these consumers who partially base taste on color. This experiment studied whether the visual impact of color can deceive consumers into tasting a false flavor. People of various age groups were given two samples of pudding to taste and identify the flavor by taste. One sample was incorrectly colored with artificial coloring, while the other sample was not colored. The results of this study proved that the color of food altered the person's taste perception.

## **19. ENERGY DRINKS: USE, PREVELANCE, AND PROBLEMS**

Quinn Dunlea, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner

**Behavioral & Social Science**

Energy drinks have been around for a long time. The first energy drink was Lucozade, invented in England in 1927. Energy drinks didn't really take off, though, until the 1960's in Japan. Energy drinks first came to North America ten years later in 1997. Since then it has become more and more popular among teens and adults. Often energy drinks are used by athletes before games or competitions, although they are also popular among students as a pick me up after long hours of studying. However harmless energy drinks may seem they have also been associated with dehydration, and sometimes even caffeine poisoning. With this in mind I developed a survey that would help me to understand the main reasons for use and who uses them the most. The results of my survey were rather surprising. I had hypothesized that young adult males would be the most common users based on how energy drinks are often marketed. Contrary to my prior beliefs, 69% of the users were female. In keeping with my earlier statements about popularity among students and athletes, 33.3% listed their reason for use as being sports related and 33.3% listed their reason as homework, studying, or essays. However 41.7% of the users had no reason other than "just because".

## **20. SOIL DIFFERENCES IN MONMOUTH AND OCEAN COUNTIES**

Tommy Fenton, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Dr. John Wnek and Mr. David Werner

**Environmental Science**

Soil quality is one of the most important components to define the habitat of an area. New Jersey is one area that has a variation of soil throughout its lands. There are different types of soil in Ocean County and Monmouth Counties alone. Soils are important because they can bind nutrients. By comparing soils with potting soil that has been enhanced with nutrients the following question can be answered: will the soil found in the Pine Barrens or the soil found in Freehold have better growing qualities? To answer this question a household English Ivy (*Hedera helix*) was used for growth comparisons. As a comparison, English Ivy plants were grown in potting soil. This experiment was conducted over the course of about two months. Soil tests were made for each soil type, comparing the amounts of nitrates and phosphates in each. These help stimulate the growth by enriching the soil with nutrients. In addition, the amounts of certain bacteria in each soil were tested to see if there is a difference. The results indicated that the plants put in Freehold's soil grew more efficiently compared to the Pine Barrens soil. This will be important information for a plant, like English Ivy, and how it can adapt and thrive in certain areas.

## **21. THE EFFECTS OF USING ORGANIC MAKEUP**

Mia Francisco, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Dr. John Wnek and Mr. David Werner

**Health & Medicine**

Over half the women in the world apply facial powder to their face everyday before leaving the house. Many women prefer to use brand name products because they are familiar with them through various forms of advertisements. Women are so loyal to the brand of makeup they use, but are those brands possibly having negative effects on their skin? To determine whether these inorganic brands were harmful to the skin, three girls were asked to test organic makeup and three girls were asked to test inorganic makeup. The facial powder would be applied everyday for two weeks. Pictures were taken to record how the skin looked and the girls recorded how her skin felt that day or if she noticed anything unusual appearing on her skin. Based on the how the participants' skin turned out at the end of two weeks, it was decided that organic makeup is better to use than inorganic makeup.

## **22. DOES THE WAY YOU LEARN INFORMATION AFFECT MEMORY?**

Connor Giles, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner **Behavioral & Social Science**

There are many types of memory and ways to remember and store information. Among the different senses, both visual and audible memory are prominent. There is speculation that information observed visually is more easily recalled than audibly recorded information. It is thought that this occurs because visual information is visually observed as well as audibly recorded. A memory test was distributed to test this concept. Ten males and ten females near the age of 15 each took a memory test. Half of the subjects received a list of simple words. The other half were read the same words aloud to for the same amount of time. Both groups had 1 minute and 30 seconds to memorize the words. Those who were able to view the list of words recalled a higher amount of words, suggesting a relationship between visual and audible memory in certain cases.

## **23. THE BEST POSITION FOR THE MOST ACCURATE BLOOD PRESSURE READING**

Hannah Glen, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner **Health & Medicine**

There are numerous positions in which a blood pressure reading can be measured, but sitting is used most frequently by health care professionals. Although sitting is the most popular position, it is important to consider the elderly or bedridden people that may get their blood pressure taken while laying down. Also, not everyone has an average healthy blood pressure. Many people suffer from hypertension, low blood pressure, or even white coat syndrome, where patients have high blood pressure in the doctor's office but nowhere else. This study compares blood pressure readings of twenty people, separated by age and gender. The results conclude that positioning has a great effect on blood pressure readings, and age and gender vary accordingly to the position. The results of this study could help to make health care providers better aware of obtaining blood pressure readings that are more consistent.

## **24. THE BEST FORM OF RUST PROTECTION**

Leah Goldsberry, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Werner **Physical Science & Engineering**

Many people look for ways to protect against rust, trusting companies when they say "Our product is the best!" But, which product really is the best form of rust protection? Along with this question, it was also attempted to answer if saltwater speeds up the rusting process when an experiment was conducted. In this experiment, nails were sprayed with various products claiming to stop rust from forming and then either exposed to saltwater, rainwater or no water. Throughout the experiment, the nails were weighed on an Ohaus Analytical Balance® to determine how much rust has formed on the nails over the course of twelve weeks. The data suggests that galvanization is the best form of rust protection and saltwater does speed up the rusting process.

## **25. HOW DOES COLOR EFFECT EMOTION?**

Arianna Grace, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Jason Kelsey and Dr. John Wnek **Behavioral & Social Science**

Are emotions linked with colors? Some say that people link colors and emotions together automatically. I wanted to find out if this saying was true, so I embarked on this study to find out the answer. My project was all about finding out what emotions were behind this automatic reaction. To get some answers, I presented surveys to a random audience. The surveys asked what emotions these people linked with the basic colors of the rainbow. Each person answered differently based on his or her personal opinion. I gathered all of my information and analyzed it. I found that most people's associations of certain colors are relatively the same. Overall, this study can be used to see why humans link colors and emotions together.

## **26. ARE LOCAL STORM DRAINS CONNECTED TO SEWAGE DRAINS CAUSING NEGATIVE HUMAN IMPACTS IN BARNEGAT BAY?**

Dylan Greene, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Dr. John Wnek and Mr. David Werner

**Environmental Science**

For many years now it has been thought that sewage systems have been emptying more than storm runoff into the local environment. To determine if this is actually occurring in the Ocean County area, testing can be done near drains that release storm water into the bay when it rains by testing for optical brighteners, which are used in very extensively in the detergent industry as fluorescent whitening agents (FWAs). If the levels of OBs spike during a rainfall event, then it can be assumed that waste run off from human homes is seeping into the bay through storm drains. To determine if this is happening currently in our local area, I tested the water from the Barnegat Bay in three different locations (two with drains and one without) for optical brighteners before a rain event as controls, then collected samples from the three locations as the rainfall event started, as the storm was starting, about an hour into the storm, and then after the storm had dissipated. The results of the experimentation showed that there actually were slightly inclined amounts of optical brighteners in the two locations with drains when a rainfall event occurred, but not in the area without a drain. This proves that human waste is actually seeping into the bay through the local sewage system, which is polluting and potentially harming the environment.

## **27. EFFECTS OF AN OWN-GENDER BIAS ON FACE MEMORY**

Jillian Hubbard, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey

**Behavioral & Social Science**

The field of behavioral science is full of uncertainty. The process of recognizing a face is intricate and unexplained, but research is being done to examine such processes. This study involves one's ability to remember a face: specifically the possibility that the average person displays an own-gender bias while remembering faces. An example of an own-gender bias would be if a female could remember a female face with more accuracy than a male face. The data suggests that females display a significant own-gender bias. Also, females seem to be more accurate than males when recognizing female faces. On average, females recognize other females with about 84% accuracy, which is about 20% more accurate than males' recognition of female faces. Male subjects, have also proved to be more accurate with their own gender, however, there is not a significant difference between the accuracy of male and female subjects when recognizing male faces. On average, males are about 78% accurate when shown male faces, which is about 13% more accurate than males recognizing female faces; however, it is only 5% more accurate than females recognizing male faces.

## **28. WHAT ARE THE EFFECTS OF CATARACTS ON A DOG'S ABILITY TO DISTINGUISH COLOR?**

Sarah Jakositz, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Dr. John Wnek, Mr. Jason Kelsey, and Mr. David Werner

**Zoology**

For many years, people have been stuck on the question, can a dog see color? Well, it has been concluded that while a dog cannot see colors as vividly as humans, they can see distinct differences between colors. But, like many humans today, some dogs develop cataracts as they age. The question is: What exactly are the effects of cataracts on a dog's ability to distinguish color? In order to answer this question, an experiment was performed with a dog, which has developed cataracts, to test her ability to distinguish between the three primary colors: red, yellow and blue. The results obtained from this experiment were then compared to those of a previous experiment performed 6 years prior with a similar methodology where the same dog did not have cataracts. By teaching her to indicate which of the objects that were being held in front of her was the red one, and comparing these results to the previously-obtained results, it was shown that her ability to distinguish color was affected in a negative way. This clearly supports my hypothesis that cataracts do in fact have a negative effect on a dog's ability to distinguish color.

## **29. CAN BAITFISH UNDERGO PAVLOVIAN CONDITIONING?**

Trevor Johnson, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),

Advisor: Ms. Kelly Zatta

**Zoology(Animal Behav.)**

Pavlovian conditioning is when an animal or person learns to associate and connect stimuli with a reflex or with necessities that they need for survival, such as food. A scientist named Ivan Pavlov conducted an experiment and discovered this behavior. Before he would feed a group of dogs, he would ring a bell. After a while, Pavlov could ring the bell without feeding the dogs and they would begin to salivate as a result. In this experiment, a group of baitfish consisting of sheepshead minnows (*Cyprinodon variegates*), banded killifish (*Fundulus diaphanous*), and mummichogs (*Fundulus heteroclitus*) were tested to see if they could undergo Pavlovian conditioning. Every day, a flashlight would be turned on and off several times above the fish tank. Observations were written down at every feeding. In addition, their reaction to the light was also written down with the observations. In the end, the fish did not respond to the light but, indeed, they connected humans with food. All in all, baitfish can undergo Pavlovian conditioning.

## **30. THE EFFECTS OF INSECTICIDES ON PLANT GROWTH**

Patrick Jones, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),

Advisors: Mr. David Werner and Ms. Kelly Zatta

**Botany**

The purpose behind this experiment is to discover whether or not insecticides have an effect on the growth of plants. Furthermore, if the insecticide does have an effect on the growth, will it stunt the plants growth, aid it in growing, or kill it. If insecticides do in fact harm vegetation, then farmers may not want to use insecticides in their crop fields. However, the data was not very significant; therefore, it could not be concluded that the insecticides had harmed the plants or aided in any growth.

## **31. THE EFFECT OF RAW CHICKEN ON THE MARINE ENVIRONMENT**

Daniel King, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),

Advisor: Mr. David Werner

**Marine Science**

Chicken is now a popular choice as bait for many fishermen. It is used for bait in crabbing as well. One problem is that the leftover chicken is tossed in the water after the crabbing day. This may attract marine life but also grows bacteria and the salt preserves it and the chicken grows more bacteria then it would in freshwater. This bacterium may be fatal to marine life when discarded in the water. Also the chicken has chemicals on it to preserve "freshness". This is because the chicken was not intended for crabbing bait, but as a meal for humans after it is cooked. The shrimp used in the experiment with chicken showed a difference in behavior and life length from the shrimp in the control tank. This shows that the chicken does effect the environment in a negative way when the scraps are tossed in the water afterwards.

### **32. MOTOR OIL EFFECTS ON THE ENVIRONMENT**

Josh Kingston, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Jason Kelsey, Dr. John Wnek, and Mrs. Jones

**Environmental Science**

Pollution in general is a huge threat to the environment and even a small amount of motor oil can have a big impact on an ecosystem if not properly disposed of. Motor oil pollution is usually found mixed in runoff along with other types of anthropogenic pollution such as fertilizers and other wastes. Oil changes in cars and trucks can produce billions of quarts of pollution a year, where 40% has been found to be dumped on the ground or in sewers. New Jersey has a good recycling program, and strongly supports recycling; however careless people across the world continue to dump gallons of oil into the sewers or even directly onto plants. Many studies have been done proving that motor oil harms the environment, and how much oil it actually takes to make a difference. In this experiment, a generic brand of motor oil was sprayed onto the roots of the bean plants after they had reached their full growth. The rate at which the plants died was measured and qualitative information was recorded. This experiment shows that there is a direct relationship between the health of the plants and the amount of oil pollution they are exposed to.

### **33. COMPARISON OF FERTILIZER LEVELS IN LOCAL GOLF COURSES**

Juli Kloza, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor:  
Mr. Jason Kelsey

**Environmental Science**

Nitrogen is a main source of pollution throughout Barnegat Bay, New Jersey. It is found in many forms such as pet waste, septic systems, and even golf courses. To maintain a golf course, the greens must be fertilized often, especially around Monmouth and Ocean Counties, N.J., because golf courses are located on sandy soils. There is also salt influence from the ocean, and acidic conditions near the Pine Barrens. Many people assume that private golf courses use more fertilizer than public golf courses to appear neater and maybe seem more attractive, on account that they are usually more expensive. However, is this true? This study clarifies the answer to that question and demonstrates the differences of the quantities of nitrates and phosphates that each golf course emits to their greens. It helps determine which golf courses have higher levels of nitrate and phosphate levels and the possibilities of nutrient runoff which may have negative impacts on the ecology of the area.

### **34. TURBIDITY IN THE BARNEGAT BAY IN RELATION TO STORM RUNOFF AND BULKHEADING**

Veronica La Du, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. David Werner and Dr. John Wnek

**Marine Science**

In the Barnegat Bay, there has always been an issue surrounding the bulkheading that is holding the water back, due to the fact that it may influence the turbidity of the Bay. A high turbidity is not good for the aquatic, and human populations who depend on the Bays resources. In order to test whether the bays turbidity is affected by bulkheading, and weather rainfall has anything to do with it, an experiment was set up to test the turbidity of the bay before and after rainfall. A natural location, and a bulkheaded location were chosen to be the collection points, and samples were taken daily in two testing periods. Later, a sediment sample was also taken from each site. It was found that mostly the natural beach had a higher turbidity, but when it rained or the bay was rough, the bulkheading had a higher turbidity. Sediment also played a role in these results as well, since the natural beach had more silt and smaller particles while the bulkheaded area had more sand.

### **35. EFFECTIVE INSULATION**

Brett Laramée, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Ms. Kelly Zatta, Mr. David Werner and Dr. John Wnek **Physical Sci. & Engineering**

Surprisingly, many homes in the U.S. do not have insulation in some of their walls or ceilings. Insulation is a great way to save money on heating bills, so why not install some? People do not jump on this simply because it is often very expensive to put insulation in just 1 room of your home. Today, it costs from \$0.50 to \$3.50 per sq. foot for standard insulation. If you are planning to insulate a whole garage or attic, that easily adds up to over \$800 for a couple walls and ceiling alone. However, there is also another type of insulation which is said to “bounce” back heat by using a reflective surface. In my project, I used tin foil. Is there an alternative to expensive insulation? This is what I found out in my research project. I used two types of standard insulation and tested my tinfoil idea. Surprisingly, the tin foil worked remarkably well. Though not as effective as the other two types, the foil does not cost nearly as much, and better yet, you can find your heating bill shrinker at any supermarket for just \$5.00.

### **36. CORRELATION BETWEEN LIGHT EXPOSURE AND COLORATION OF *Palaemonetes vulgaris***

Barry Lathrop, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Dr. John Wnek and Mr. David Werner **Zoology**

Shrimp are often not thought about as a functional species by many species and usually referred to as a food source. Some people see shrimp and think of cocktail sauce, not of a scientific experiment. However, shrimp are extremely useful for scientific investigation and learning about the marine ecosystem. For example, *Palaemonetes vulgaris*, the common shore shrimp, is a great test subject. The shrimp, abundant along the shoreline, are hardy creatures that, once acclimated to an environment, can survive a variety of hardships. Due to this fact, *Palaemonetes vulgaris* was chosen as the subject for a test on chromatophores. Another trait that makes the shrimp perfect is the location of the hormones that control chromatophores color change, in the eyes. An experiment was performed using different colors of light and observing the effect the light had on the shrimps' coloration. After three weeks, it was observed that the shrimps' colors did change slightly, with the most change occurring in the tank with red light. This may be due to the fact that red light is the least common in the natural habitat of the shrimp, so it had the most drastic effect on their coloration. This may be important since global climate changes may produce more cloud cover along coastal areas which may change the exposure of different wavelengths of light.

### **37. SLOW RELEASE FERTILIZERS VS. QUICK RELEASE**

Cassie Leahy, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey **Environmental Science**

Over the past few years, a controversy has developed over which type of fertilizer is the best to use for both the environment, and for plants. Time-release fertilizer releases its nitrates and phosphates over an extended period of time and is thought to be the most efficient in growing plants for the long term. Quick-release fertilizers release all of their nitrates and phosphates at once and aims to grow plants to their largest size, quickly. However, many people choose time-release fertilizers because they do not have to mix fertilizers, either into the water or onto the plants, as often as they would have to if they watered their plants with quick-release fertilizers. This study aims to answer which fertilizer is the best to use and which is less harmful to the environment. It is important to learn which fertilizer is the least harmful because fertilizer run-off is one of the biggest problems facing Barnegat Bay, New Jersey at this point in time. The results of this study can help us to learn how to better protect our environment and yet still maintain our lawns and household plants.

### **38. THE EFFECTS OF DIFFERENT FOODS ON THE BEHAVIOR OF KILLIFISH**

Andrew Levorse, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner and Dr. John Wnek **Zoology(Animal Behav.)**

Fish foods are one of the major things that you have to think about if you are keeping fish. There is such a wide collection of different foods. So how do you know which is the best choice? Is there a certain fish food that makes your fish nice to each other, yet active and beautiful at the same time? The purpose of this experiment was to answer that very question. In order to do this, killifish were collected from the bay and kept in three separate groups (one group for each of the different foods being tested). The three different foods were sun-dried *gammarus*, goldfish flakes, and frozen baby brine shrimp. The fish were observed in how they behaved on a regular basis. There was a very clear difference in the results of the three different groups. The group that was fed sun-dried *gammarus* had a high mortality rate so their results were inconclusive. The fish that were fed the goldfish flakes maintained fairly average levels of activity and aggression. The fish that were in the group that was fed frozen baby brine shrimp had low levels of activity, but high levels of aggression. It was concluded that there may be a way to mix the foods using the different results to produce a food that keeps aggression low, activity levels up, and does not have a high mortality rate when fed to fish.

### **39. DIFFERENTIATION IN THE AMOUNT OF SULFATES BETWEEN WAMPUM LAKE AND LAKE MANAHAWKIN**

Bradley Louth, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner **Environmental Science**

Sulfates form sulfuric acid in water. They can be caused by pollution, burning of fossil fuels, and industrialization in an area. The more populated an area the more likely it is to be a city that has a lot of industry. This experiment tested to see if population density and industry had a major effect on a lake's sulfate levels. Sulfate levels were taken from two lakes, Manahawkin Lake and Wampum Lake. Wampum Lake is in an area with a population density of 1,000 to 2,000 people per square mile and Manahawkin Lake is in an area with 79 to 200 people per square mile. After every time it precipitated, a sulfate test was taken to look for change. Wampum Lake had a higher amount of sulfates in the water but both lakes tended to increase about the same. The mean increase for Wampum Lake was 1.6 ppm and 1.5 ppm in Manahawkin Lake. This slight discrepancy does not prove that industry and population density significantly affect the level of sulfates in the water.

### **40. EFFECTS OF TEMPERATURE ON VITAMIN C LEVELS OF FRUIT**

Lindsey Mahnken, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. David Werner **Botany**

Many people look to fruit for their daily dose of Vitamin C. However, are they truly getting the full benefits of the fruits they put in their mouth? Fruits are held in many different environments and temperatures, so does this have an effect on the Vitamin C levels contained in the fruit? By using a simple method of titration, fruits including oranges, lemons, and limes were tested from three different temperatures: room temperature, refrigerated temperature, and boiled temperature. The temperatures are very distinct from each other, so it was assumed that the results of Vitamin C levels had to be distinct from each other. After the experiment was performed and the data was collected, there was an obvious result. The quantitative data showed an extreme difference in the levels of Vitamin C of various fruits and temperatures. It also showed that fruits have the strongest amount of Vitamin C when kept at room temperature, and that oranges have the strongest amount of Vitamin C. It can be easily distinguished that people can affect the fruits they eat by the temperature, and they can now know how to get the best benefits out of their fruit.



#### **41. SPLENDA® VS. SUGAR**

Meaghan Martin, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Werner

**Health & Medicine**

Sucralose, better known as Splenda®, was FDA approved in the late 1990s and has since become a popular sugar substitute. It is made from sugar by replacing three hydrogen-oxygen molecules in sugar with three chlorine atoms. Both sweeteners have different qualities that result in distinctive tastes in products made with them. An experiment was designed to test whether high school students could taste the difference between Splenda® and sugar as well as which one they thought tasted better. It was hypothesized that most of the people would be able to correctly distinguish between the cookie made with Splenda® and the cookie made with sugar. It was also hypothesized that most of the people who took part in the taste test would think that the cookie made with sugar tasted better than the cookie baked with Splenda®. Two identical taste tests were conducted at M.A.T.E.S. It was concluded that about 2/3 of the people tested correctly identified which cookie was made with sugar and which was made with Splenda®. The results also concluded that almost all of the people tested preferred the cookie made with sugar over the cookie made with Splenda®.

#### **42. WHAT EFFECTS OF VARIOUS LIGHT SOURCES AND SUBSTRATE HAVE ON SHORE SHRIMP (*Palaemonetes sp.*)?**

Colleen McGrath, Block 3 Science Class, Marine Academy of Technology and Environmental Science, Advisors:  
Dr. John Wnek and Mr. David Werner

**Zoology**

The Shore Shrimp is a species common to New England waters that is known to change color due to its surroundings and the food consumed by the shrimp. The bottom substrate plays the main role in the color change of shrimp, as well as the available lighting. The change in color may not be the only effect substrate and lighting has on shore shrimp. The behavior of shrimp was studied through multiple trials with two different substrate and three different forms of light. Data was recorded each day in order to see patterns of behavior due to the different surroundings. The data was analyzed and relationships between the lighting and substrate were displayed. Because natural sunlight is familiar to the shrimp, not many changes were present. Although in various other lighting, such as ultraviolet lighting, and different substrate the behavior of the shrimp was not normal. The results indicate that behavior and habits of shrimp can be affected by several forms of lighting and substrate.

#### **43. LURE COLOR: STRIPED BASS CATCH AND BITES**

Parker Milkosky, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey and Dr. John Wnek

**Zoology(Animal Behav.)**

The fish eye is fairly close in structure to other vertebrae species. Like humans, they have the iris, cornea, pupil, retina, and lens. However, they cannot see all of the colors humans can. Fishermen claim fish cannot see red, which is true, and that it is sometimes best to use a red lure. Other fishing lore says that fish will go after different colors each day. The experiment was to see whether or not fish have a preference over color. Over the course of 2 weeks, experimenting occurred in the same location using the same bait, which is bloodworms, and 4 different colored lures. The lures were colored black, green, yellow, and red. Four rods were used at once, over the course of a 3 hour period each day, and Striped Bass were the only fish accounted for in this experiment. According to the data, the red lure is most effective at catching Striped Bass. Yellow had shown to be the least effective lure color among the four.

#### **44. IS IT POSSIBLE TO MAKE A SELF-SUFFICIENT CAR?**

Omar Mohamed, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisors: Mr. David Werner and Dr. John Wnek

**Physical Sci. & Engineering**

Oil is the single most important thing in this world, unfortunately. It is what powers almost all machinery, including the most important, cars. Because of the necessity of all sorts of transportation, oil is produced, consumed, and especially wasted at an alarming rate. By harnessing the power of solar panels, specialized wind turbines, and regenerative braking systems, it is possible to render a self-sufficient electric car achievable, impossible, or completely impractical. With the given test subject, a 2002 Chevrolet Impala, it would be possible to incorporate 160 watts worth of solar panels. Due to testing, it was concluded that wind speeds outside of a moving car are slightly faster than the speed of the car, so if a wind turbine were incorporated into the car with a generator that resembled that of one of the wheels motors, a substantial amount of energy could be produced. A regenerative brake system, when used properly could increase efficiency by approximately 30%. Based on this evidence, it is safe to assume that theoretically it may be possible to produce a self-sufficient car, but this car must have many more modifications than the average car.

#### **45. VIABILITY OF HYDROGEN AS A SOURCE OF USEFUL WORK**

Dylan O'Hara, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisors: Mr. Thomas Lanagan, Mr. Patrick O'Hara & Mr. David Werner

**Physical Sci. & Engineering**

The Hydrogen economy is touted as the future of energy, but it is highly uneconomical, for a variety of reasons. The most important of these reasons is production. The best way to produce Hydrogen is electrolysis, which requires large amounts of electricity that make it prohibitively expensive. However, if a way was found to recover that spent energy, this problem would be overcome. Thus, the purpose was to find if Hydrogen could be used to spin a multitude of turbines at similar or equivalent speeds, which, in conjunction with a Hydrogen fuel cell, would create an economically stable power station. The experiment was performed by measuring the rotations per minute (RPM) speed of a turbine introduced to rising Hydrogen at different heights from the production well. When the turbine was in the 'low' position, it was found to have an RPM of ~18 at 65 Watts. In the first 'high' position, the turbine was found to not move at all, and in the second 'high' position, it was found to move slowly at ~4 RPM. These results were found to be inconclusive, as it could not be known whether the difference in RPM was due to a loss of kinetic energy, the reaction between Hydrogen and Oxygen which caused there to be less Hydrogen performing work, or a mixture of the two, but further testing revealed loss of Hydrogen to be the main, if not sole, contributor to the loss of work. Further research will be required in laboratory conditions to determine whether or not it is indeed the sole contributor.

#### **46. IS BOTTLED WATER REALLY PURER THAN TAP WATER?**

Jainita Patel, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisors: Mr. Jason Kelsey and Dr. John Wnek

**Environmental Science**

The source of where people get their water from is important. Certain sources could contain high levels of dissolved substances and metals that could pose long-term health problems. Some of these include chlorine, bromine, and copper usually found in tap water. Sometimes if water sits in pipes for extended periods of time, the substances and metals may be more prevalent than in water that is running for minutes flushing out residual water in the pipes. To determine chlorine, bromine and copper levels, tap water was tested (first draw and running for 5 minutes) and compared with bottled water using a LaMotte SMART2 colorimeter. The experiment was run for several weeks and all results were analyzed for significance using a Student t-test. The results indicated that bottled water had the least amount of chlorine, bromide, and copper. Tap water, run for five minutes, resulted in greater amounts of bromine, free chlorine, total chlorine, and combined chlorine. First draw tap water showed the greatest amount of copper levels, and was significantly higher than running water and bottled water. These results indicate that there are trade-offs in the use of tap water, which could have implications for human health.

#### **47. CAN OLDER PEOPLE LIE BETTER THAN YOUNGER PEOPLE?**

Rebecca Paulikens, Block 4 Science Class. Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Dave Werner. **Behavioral & Social Science**

People can sometimes provide cues when they lie that allow for detection of the lie. Some cues may be a red face, shaking hands, or a jump in pulse. Detection of lies has been used in criminal cases, in work places, and in between friends. An experiment was performed to determine if older people lie better than younger people. The experiment included four age groups from the ages ten to ninety. Each participant was asked series of questions about playing cards while their pulse was recorded to see any changes. The experiment has shown that the age group thirty-one to fifty had the best ability to lie based on a group. The age group seventy-one to ninety had the least change in pulse when looked at individuals. The people in this age group had their pulse go down when it came to the lie. This means that individual, ages seventy-one to ninety have the best ability to lie. The groups with the worst ability to lie (individuals) was the ages ten to thirty because the young people have not taught their minds to pay no attention to white lies, while older people have (Persaud). The experiment supported with the hypothesis: if an adult can lie better than a child, then the adult's pulse will be lower than the child's during each test because the adult understands the effects of lying. This data can help with the development of better lie detection methods that police can use to capture and incarcerate criminals.

#### **48. THE EFFECTS OF SLEEP AND BREAKFAST ON STUDENTS' TEST GRADES**

Ariel Petchel, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. Jason Kelsey, Dr. John Wnek, and Ms .Kelly Zatta **Behavioral & Social Science**

A number of factors can affect a student's test grade. Some of these factors can influence the score greatly. The day before a prominent test is given out to students, they are told to eat a good breakfast and get a good night's sleep. However, can these two variables drastically influence a student's test grade? The purpose of the "The Effects of Sleep and Breakfast on Students' Test Grades" experiment was to reach a scientific conclusion to this question. Freshman students from the Marine Academy of Technology and Environmental Science (M.A.T.E.S.) received two different I.Q. tests on different days. Before analyzing the data, it was separated into different categories so results could be viewed in how sleep and breakfast eaten affected the test scores. A correlation between number of hours slept, breakfast eaten, and quality of work performed was discovered. The average difference in percentage of students' test scores who got more/equal to and less than seven hours of sleep is 3.23%, with students who slept seven or more hours having a higher percentage. The average difference in percentage of students' test scores who ate and didn't eat breakfast is 6.66% (students who ate breakfast had the higher percentage).

#### **49. PERFORMANCE IN DIFFERENT TYPES OF BASEBALL BATS**

TJ Phillips, Block 3 Science Class, Marine Academy of Technical and Environmental Sciences (MATES), Advisors:  
Mr. David Werner and Dr. John Wnek **Physical Sci. & Engineering**

There are three basic different types of baseball bats. These are wooden, aluminum, and composite bats. Is there a difference in performance among these types of bats? To assess this question, an experiment was done by hitting baseballs with these types of bats and measuring the distance they traveled. To eliminate variables, the pitch speed was kept constant by being fired from a pitching machine. Also, only the top 30 hits from each bat were taken into consideration to determine the average. This eliminated any badly hit balls. After the data was analyzed, a conclusion was reached in that the composite bats produced the best performance, while the wooden bats produced the worst.

## **50. THE EFFECTS OF SOFT DRINKS ON TOOTH ENAMEL**

Sophia Porras, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey

**Health and Medicine**

Soft-drinks are beverages consumed by many Americans every day in large quantities. They can be found in vending machines, barbeques, and sometimes schools. Soft-drinks have become so common that people seem to forget that they could have negative effects. This study addresses effects of soft-drinks on human teeth. The drinks chosen for this study were Coke®, Diet Coke®, Sprite®, Pepsi®, and Mountain Dew Original®. The teeth were then submerged in the drinks for a total of 500 minutes and they were brushed and cleaned at the end of every 100 minute period. Results showed that, compared to the controls water and air, there was a significant loss of tooth enamel. Diet Coke® with a total weight loss of 3.72% proved to be the most erosive. While Mountain Dew Original® was the least erosive and had a weight loss of 0.93%. All in all, the experiment supported my hypothesis and showed that soft-drinks are erosive toward tooth enamel.

## **51. ARE YOUR SENSES LINKED?**

Samantha Posta, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Dr. John Wnek, Mr. David Werner, and Ms. Gail Meehan

**Behavioral & Social Science**

When a person loses one sense, another will heighten, such as a blind person having increased hearing capabilities. This may actually hold some truth, in the fact that the human sensory organs are all controlled by a central nervous system that is connected to the brain. Each sensory organ contains specialized cells and tissues that allow it to detect stimuli from surrounding environments. In an attempt to prove this hypothesis correct, an experiment was conducted where the subjects were to wear a blindfold or earplugs for an hour. The volunteers had their hearing and vision tested both before and after the test. The final results of the test support the initial hypothesis that there is a correlation between the human senses of sight and hearing.

## **52. DO VIDEO GAMES HELP TO IMPROVE REACTION TIME?**

Greg Resch, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Jason Kelsey

**Behavioral & Social Science**

Video games have been the subject of many studies. Some studies have found a correlation between the amount of video games played and reaction time, but do video games really affect reaction time? To test this correlation, the "Attention Network Test" from the University of Rochester was distributed electronically to 131 individuals from the ages of 7 to adult to identify the results of playing action video games' relation to reaction time. Age and gender were used to separate test subjects into several categories, which factored into the overall reaction time. Data was then analyzed to identify a correlation between playing action video games and reaction time. A correlation was identified between playing action video games and reaction time, thereby proving that there is a relation between playing video games and reaction time.

### **53. CONTAGIOUS YAWNING IN DIFFERENT GENDERS AND AGES**

Alyssa Richardson, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisors: Dr. John Wnek and Mr. David Werner

**Behavioral & Social Science**

Contagious yawning is a very strange phenomenon that occurs with many different animals, including humans. Scientists are not quite sure why yawning is contagious, or even why people yawn in the first place; but, is there a certain age or gender that is more likely to experience contagious yawning? What is the more likely to make people yawn—the sound or sight of a yawn? To complete this experiment, a video was made of three students yawning; one male and two females. The subjects watched the video three times, (once with audio only, once with video only, and once with both audio and video). The participants were closely observed. It seems that females are more likely to yawn than males. Those between the ages of twenty-six and thirty-five yawned more frequently than other age groups when the audio-only portion was played. During the video-only segment, people between the ages of eighty-six and ninety-one yawned the most. The sound of yawning made people much more likely to yawn than simply the sight of it. Many scientists believe that contagious yawning may be part of an empathy link. Since it is generally believed that fully developed, female adults are more empathetic than children and males, the results are logical.

### **54. THE HYDRODYNAMIC WIND TURBINE**

Josh Speyer, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Mr. David Werner

**Physical Sci. & Engineering**

To test the effects of fabricated tubercles on the leading edge of wind turbine blades, a model variable-pitch wind turbine was constructed and tested in the MIT wind tunnel under varying wind conditions. Pitch was controlled by a program, and the optimal operating angle for both regular blades and modified blades was determined, based on RPM readings and wattage creation. Numerous other tests were also completed. Maximum angle of attack on the regular wind turbine blades was 14.8, while maximum angle of attack on the modified blade was near 16.7. The tubercles thereby increased optimal angle of attack angle, increasing RPM and power output. The optimal pitch could also be increased due to this angle of attack increase, delaying stall and stall severity. Minimal turbulence increase was noted in wind speeds below 7 m/s for the modified blades, acting as a slight detrimental effect on lift. With tubercles, vibration was minimized at high wind speeds, but the difference was very miniscule. No statistic difference was determined in relation to vibration for both blades at X, Y, and Z-axis. The lowest P-value was 0.0559913, causing all hypotheses that there was a significant difference in vibration of the wind turbine blades to be rejected. Numerous calculations during operation were calculated, and with these measurements, angle of attack, tip speed ratio (TSR), blade angle, and the lift coefficient were determined.

### **55. IS THERE A PATTERN BETWEEN A PERSON'S DOMINANT HAND WHICH THEY USE FOR EVERYDAY TASKS AND THEIR DOMINANT HAND THEY USE WHEN PLAYING SPORTS?**

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**Behavioral & Social Science**

Not every person uses the same dominant hand for everyday tasks as they do for sports. Some right handed people throw a baseball with their left hand. Why is this? Could there be a pattern between a person's general dominant hand and their sport dominant hand? A survey was distributed to 24 athletes ranging in age from 14 to 18 years old and experience from 1 month to 16 years. The purpose of the survey was to identify the dominant hand that the athletes surveyed use for everyday tasks and their sport's dominant hand. The surveys were separated first by the sport that they were filled out for, then by hand dominance, then by gender, then by experience. The data suggested that athletes who had more experience in their sport had, generally, the same hand dominance as their coach. Some surveys even revealed that athletes were influenced by their parents to use their not dominant hand when playing sports. The results suggest that athletes are influenced by their superiors when it comes to their hand dominance in sports.

## **56. COMPARISON OF HANDWRITING AND COMPUTER WORD PROCESSING TO THE RETENTION OF DATA IN A SCHOOL ENVIRONMENT**

Natalia Stifano, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. David Werner and Dr. John Wnek **Behavioral & Social Science**

As the world moves into the twenty-first century, technology becomes even more available. Even in schools, students are switching from handouts to powerpoints and projectors, and pen and paper to laptops. Some students prefer taking notes on their laptops, because it is more convenient, and they can type faster than they can write. However, there have been criticisms of using computers in class. Students are getting distracted and using their time that should be spent taking notes or completing classwork surfing the web, checking emails, etc. But is a word processing program better for the retention of information than handwriting? According to two experiments conducted, students between the ages of fourteen and fifteen preferred laptops over handwriting, however; the results of their tests of retention of data proved that handwriting was more helpful than computers. A correlation was not shown between males and females in the experiments conducted.

## **57. HYDROPONICS VS. CONVENTIONAL SOIL; WHICH IS OPTIMAL FOR PLANT GROWTH?**

Rahul Syal, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. David Werner and Dr. John Wnek **Botany**

For centuries, plants have been grown in conventional soil environments. Many people are unaware of the other way of growing plants; by using water. The process in which plants are grown in water is called hydroponics. Hydroponics originated from the early 1700's, by growing spearmint in water. A common belief is that plants need natural sunlight and soil to grow. In actuality, plants only need carbon dioxide, water, and light to grow. I set out to test whether basil, an herb, would grow better in garden soil or tap water. Tap water is healthy for plants because it is nutrient-filled. For my experiment, I created three trials in which a soil-filled pot and hydroponic mediums were utilized. Hydroponic mediums provide structural support and hold water. After analyzing the recorded data, it was found that both soil-based and water-based plants grew to about the same lengths over the course of the trial. Also, water-based plants had a lower mortality rate than soil-based plants, and water-based plants grew more quickly than soil-based plants at the beginning, but then slowed down to an equal pace with the soil-based plants.

## **58. WHAT IS THE PREFERRED FOOD CHOICE OF THE COMMON SEA STAR (*Asterias forbesi*)?**

Joshua Throckmorton, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Mr. Jason Kelsey **Zoology**

Typically, it is common belief that something with no brain, such as the common sea star, could not develop a particular food preference. But is this really true, and can this creature actually have a specific choice of food? To come to a conclusion, a tank of five starfish were kept in a forty-eight gallon tank with two difference species of bivalves, the Blue mussel (*Mytilus edulis*) and the Hard clam (*Mercenaria mercenaria*). An even number of individual sea stars were randomly spread around the tank, and the sea stars were free to roam. A significant conclusion resulted from this test: over a thirty day period, while seven mussels were consumed, no clams were devoured! It is also certain that this is not purely chance, as the sea stars were observed to have crawled over the clams, but never attempted to open one, and would shortly continue on to a mussel. The conclusion shows that, given the choice between the blue mussel, and the hard clam, the common sea star preferred the blue mussel.

## **59. DOES HANDEDNESS AFFECT MEMORY RETENTION?**

Danny Torri, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),  
Advisor: Mr. Dave Werner

**Behavioral & Social Science**

The temporal lobes of the brain are found in the right-hemisphere of the brain. The temporal lobes are also the part of the brain that controls memory. Many people relate handedness to brain dominance; people who are right-handed are dominant in the left side of the brain and vice versa. Is handedness really related to memory retention in an individual? In order to reach a conclusion, a test had to be created and distributed to different left-handed and right-handed individuals. There were three parts of the test: two story parts and a word list part. The first story part, the individuals had to read a story and remember the phrases of the story they read. After 15 minutes, they had to recite the story again. In the word list test, the individuals had read a list of words and remember them. 30 people were tested in total. These tested were scored based on the number of correct phrases or words they remembered from the test. The average number of correct phrases or words that the left-handed people remembered was compared to the average number of correct phrases or words that the right-handed people remembered. The data was compared and the results indicated that left-handed people performed better on the test than right-handed people, but right-handed people had less of a difference between the first and second parts of the test.

## **60. WHICH METAL WILL RESIST ELECTROLYSIS IN SALT WATER MOST EFFECTIVELY?|**

Brian VanOostendorp, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Mr. David Werner

**Marine Science**

Over time, any metal submerged in salt water will degrade if an electric current is passing through it. This phenomenon is called electrolysis. Different metals will degrade at different rates when exposed to these conditions based on how hard, soft, reactive, or nonreactive they are. Boat owners know firsthand about electrolysis, and are careful consumers when they purchase boats for themselves. They make sure that they are informed about the composition of the hull, which will not only be exposed to salt water, but an electric current as well. Wishing to extend the life of their watercraft, boat owners need to know which metals decompose the slowest under these conditions. This experiment was performed to test the deterioration rates of five different metals when exposed to a reproduction of what happens during electrolysis. These metals were connected to their own circuits that featured stainless steel bolts as a control, which in theory should have collected the particles that each test metal lost over the course of this experiment. Each metal was subjected to a constant electrical current of equal voltage and amperage while submerged in salt water solutions of the same salinity. After the data was collected and analyzed, it was determined that the metal that was most resistant to electrolysis was lead.

## **61. WILL GEARS RUNNING IN SYNTHETIC OIL SHOW LESS WEAR THAN THOSE RUNNING IN CONVENTIONAL OIL?**

John Van Oostendorp, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Mr. David Werner and Dr. John Wnek

**Physical Sci. & Engineering**

Wear of metal parts is defined as the gradual breakdown of metal. Adhesive wear is a type of wear, and it occurs when two metal surfaces slide over each other or are pressed into one another, thus promoting material transfer between the two surfaces. When oil is introduced in the process of wear, the rate of wear is drastically decreased. There are predominantly two different types of gear oil - synthetic and conventional. These two different types of oils have very different chemical compositions and are made with different additives, so they slow down the process of wear at different rates. In this experiment, I powered two separate gear boxes in two different jars, one with synthetic oil in it and one with conventional oil. Every two weeks for five months, I took pictures of each gear so that I could determine the gradual wear on the gears. I used the pictures I took to determine which set of gears expressed the least amount of wear, and with this information, I determined which oil is more effective in slowing the process of wear. After analyzing the data I collected, I determined that the gears running in the synthetic oil exhibited less wear than those running in the conventional oil.

## **62. MOTION SICKNESS & READING**

Joshua Weinberg, Block 1 Science, Marine Academy of Technology and Environmental Science (MATES),  
Advisors: Mr. David Werner and Ms. Kelly Zatta

**Behavioral & Social Science**

Many people cannot read a book in a moving vehicle without feeling nauseous or getting sick. There are also many people who can sit in a moving vehicle and read for hours on end without feeling even slightly nauseous. What causes this phenomenon? Can it be controlled by changing a person's behavior in everyday life, or is it something that cannot be controlled? This study was conducted to answer these questions. Twenty people were chosen and were given the same book to read for twenty minutes. Their heart rate was recorded before the test, and then recorded again every five minutes. Along with heart rate, other factors were recorded, including previous cases of motion sickness, average weekly exercise, and the time between the last meal and the test. Data was separated by age group and gender, to determine whether athleticism or time since last meal would affect the results of the experiment. No correlation between last meal and sickness factor was found; however, there was an inversely proportional correlation between weekly exercise and sickness factor.

## **63. DOES PREDATION AFFECT THE REPRODUCTION OF FISH?**

Meaghan Young, Block 4 Science Class, Marine Academy of Technology and Environment Science (MATES),  
Advisor: Mr. David Werner & Dr. John Wnek

**Zoology**

Stress in fishes' lives can be caused by incessant harassment from other fish, especially predators. This stress can affect a fish's reproduction, and usually causes abortions if the stress is severe and sudden. An experiment tested to see if a predator's presence would affect the reproduction of a swordtail and a black molly. Tanks were set up, the fish were added, and a divider was placed in one tank to separate the predator from the swordtail and mollies. Unfortunately, neither of the fish reproduced; however, there was a difference in the fishes' sizes and aggression levels. The predated fish were larger and more aggressive than the non-predated fish; on the other hand, the predated mollies aborted their young from the male mollies at the store while the non-predated mollies gave birth. Even though the fish never reproduced together, however, it was proven that predation on a fish does affect their reproduction, along with a few other variables.

## **64. CAN GOLDFISH LEARN TRICKS AND PERFORM THEM ON CUE?**

Stephen Zuckerman, Block 4 Science Class, Marine Academy of Technology and Environmental Science  
(MATES), Advisor: Mr. David Werner

**Zoology(Animal Behav.)**

This project was designed to show how animals, with two common goldfish (*Carassius auratus auratus*) being the example, are more intelligent than common knowledge holds. The goldfish were held in a tank and taught tricks daily so they would learn them. This was done with the use of a feeding wand, which lured the fish through the hoop and the tunnel obstacles. The obstacles were removed from the water after being used. Data was recorded as to how successful the training was. After the goldfish learned the processes of accomplishing the tricks, the process was repeated without the use of the feeding wand. The hoop was placed into the water, and the fish recognized it and swam through it. The same was done with the tunnel, and with similar results. Graphs were made to help analyze the data, and a correlation was shown that with more practice, the goldfish performed the tricks more accurately. It was found that the goldfish were initially afraid of the obstacles, which impeded progress. However, with more practice, they quickly learned how to maneuver the tricks. This data likely holds true with many test subjects, even humans. This experiment clearly shows that goldfish are somewhat intelligent, and these results could certainly be emulated with more advanced animals too.



**Notes:**