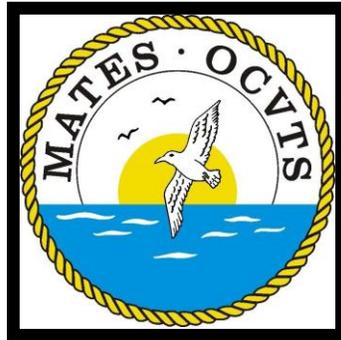


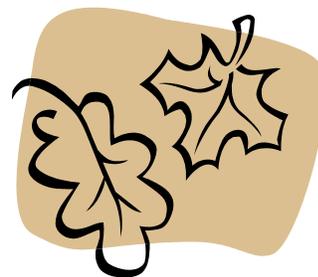
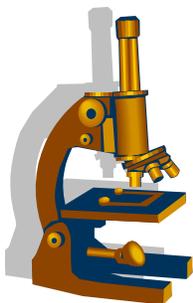
Marine Academy of Technology & Environmental Science



Sixth Annual Freshman Research Showcase

Abstract Guide

April 18, 2012



April 16, 2012

It is hard to believe that this is our sixth 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 18, 2012. Many hours went into the projects as the freshman class will be presenting their posters and they will be displayed in alphabetical order of their last name according to the category; however, they will be judged depending on their category.

We would like to thank the Class of 2015 for their project presentations this year. The students worked hard and it will show in the following abstracts, and during the poster session. Thanks to the MATES Parent-Teacher-Student Organization who generously provided funding for several of the research projects including bacterial testing materials and photometers. 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 2012 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

TABLE OF CONTENTS

<u>CATEGORY</u>	<u>PAGES</u>
BARNEGAT BAY	4 – 6
BEHAVIORAL & SOCIAL SCIENCE	7 – 9
BOTANY	9 – 13
ENGINEERING, MATH & PHYSICAL SCIENCE	13 - 16
ENVIRONMENTAL SCIENCE	17 – 19
HEALTH, FORENSICS & SPORTS PHYSIOLOGY	20 – 21
MARINE SCIENCE & METEOROLOGY	22 – 25
ZOOLOGY	25 - 28

BARNEGAT BAY CATEGORY:

1. THE EFFECT OF LAND COVER ON THE pH LEVELS IN THE TUCKERTON CREEK WATERSHED

DanaRose Brown, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Werner and Dr. Wnek

Waterways in the Pinelands region of New Jersey are more acidic than waterways in other areas of the country. After it rains, the pH of the water can change due to runoff and acid rain. In areas with more developed land cover, there are more substances on the surface of the earth that can affect the pH levels when it rains, but, how much are the pH levels of waterways affected by the land cover of the areas surrounding them? To test this, water samples were gathered from three sites in the Tuckerton Creek Watershed one day before rainfall and then for at least three days after rainfall. This process was repeated for several different rainfall events over a five month period. Site 1 was located along the Mill Creek branch of the Tuckerton Creek Watershed where there is limited development. Site 2 was located along the Giffords Mill branch of the Tuckerton Creek watershed where there is a considerable amount of development. Site 3 was located along Pohatcong Lake, where the Mill Creek and Giffords Mill branches come together. After analyzing the data, it was concluded that the pH levels at site 1 decreased after rainfall. At site 2 the pH levels increased after rainfall. At site 3, the pH levels increased for one day after rainfall and then dropped back to the same pH as before rainfall and continued to drop. The study revealed that there was a definite measurable difference in the pH levels between site 1 and site 2 due to the difference in land cover in the surrounding areas.

2. IS MACROSCOPIC POLLUTION A PREFERRED HABITAT OF THE SAND SHRIMP (*Crangon septemspinosus*), OR DO THEY PREFER THE NATURAL ENVIRONMENT?

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

The debris that can be commonly found in the Barnegat Bay includes glass, tiles, metallic objects, plastics, and more. The pollution of macroscopic debris was introduced by humans, and this experiment was designed to see if the large debris could possibly be creating a shelter for aquatic invertebrates, such as sand shrimp, *Crangon septemspinosus*. A tank was set up with a filter laced in the middle between a section of the tank containing macroscopic debris and a section of the tank containing a more natural environment for the sand shrimp. The sand shrimp did wander into the section with debris, but appeared to prefer the natural environment setting. The reasons for the few that preferred the debris may include that food was captured in the tighter nooks between bottles and metallic objects. Some shrimp were found dead, typically in the debris section.

3 THE LEACHING OF NITRATES THROUGH LOCAL OUTDOOR MATERIALS

Bethany Hartney, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Kelsey

It has long been debated which outdoor material is best for use in the yards of people living near the shore. Some of the top materials seen are sand, stones, and a sand-soil mixture. To know which of these is best to use, the affect of each materials on the environment must be known. Because nitrogen is an ever increasing danger to the Jersey shore environment, my experiment tested the change in nitrates (NO₃) of tap water and nitrogen water drained through the three materials, sand, stones, and a sand-soil mixture. My results suggest that although the sand and sand-soil mixture remove a lot of nitrates when exposed to nitrate filled water, they release almost as much when exposed to plain tap water. The stones however, released very few nitrates both times.

BARNEGAT BAY CATEGORY (CONTINUED)

4. HOW DO NITRATES THAT ARE TYPICALLY PRESENT IN COMMON FERTILIZERS AFFECT THE INVERTEBRATES OF BARNEGAT BAY?

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

Nitrates are present in common fertilizers to help promote plant growth, but they may be toxic to marine life. When fertilizers are used for plants that grow near bodies of water, it can run off after rain. Then, the marine life is exposed to excess levels of the nitrates. How toxic the nitrates are is unknown, but if there is an excessive amount of them in the water, then the marine life might be poisoned. I tested the toxicity of nitrates by placing measured amounts of fertilizer which contained 0.7ppm, 7ppm, 17.5ppm, 35ppm, 70ppm and a control of no extra nitrates in the water of *Palaemonetes spp.* The results showed that excessive amounts of fertilizer will kill the invertebrates and are thus toxic.

5. HOW DISCHARGE WATER AFFECTS THE ORGANISMS OF BARNEGAT BAY

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

The Oyster Creek Nuclear Generation Station is the oldest running nuclear power plant in the United States. This plant alone powers about 600,000 homes each day and draws about 1.4 billion gallons of water (about 2.8% of the volume of Barnegat Bay) every day from Barnegat Bay waters for cooling and circulation. This water takes in and kills larvae and eggs small enough to pass the screens. Even worse, discharge water is released back into Barnegat Bay at temperatures 23°F greater than the surrounding water. To determine if this constant increase of temperature has an effect on the organisms of Barnegat Bay, three tanks were set up with shore shrimp (*Palaemonetes sp.*). Each tank contained approximately twelve shrimp. The first tank, "Tank 1", represented Barnegat Bay without discharge water. "Tank 2" and "Tank 3" had discharge water added daily. "Tank 1" and "Tank 2" were kept at summer temperatures and "Tank 2" and "Tank 3" had hot water added to them daily. The temperature of the water, the discharge water, and the population of shore shrimp were observed daily. This experiment was created to demonstrate the hypothesis that a spontaneous release of hot water in Barnegat Bay harms its organisms.

6. EFFECT OF SUDDEN TEMPERATURE INCREASE ON SHORE SHRIMP

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

Oyster Creek Nuclear Power Plant in Lacey, NJ, takes in water from Oyster Creek, passes it over the plant's nuclear reactors to cool them, and then releases it back into the creek, ten to fifteen degrees warmer than the surrounding water. This experiment showed the negative effects of this process on Oyster Creek and Barnegat Bay. I used a heater to increase the temperature in a tank of eight shore shrimp by ten degrees after leaving the tank at room temperature for twenty-four days. I theorized that the longer the shrimp were exposed to the increased temperature, the worse their condition would become. Half of the shrimp died within twenty-four hours of the temperature change. None of the surviving shrimp died in the following six days, even though I kept the tank at that warmer temperature, so my hypothesis was not entirely correct. This implies that the initial shock of the temperature increase affects shrimp more than the amount of time they were exposed to the warmer water. In addition, this means up to half of the marine life exposed to heated water flowing into the bay and creek from the plant could die within twenty-four hours.

BARNEGAT BAY CATEGORY (CONTINUED)

7. THE CORRELATION BETWEEN RAINFALL AND RUNOFF

Daniel Schwindinger, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Dr. Wnek

The runoff from rainfall precipitation flows into storm drain on streets. In coastal Ocean County storm drains empty into the Barnegat Bay. The area surrounding Barnegat Bay has a fluctuating amount of rainfall. Some thunderstorms and northeastern storms bring greater amounts of rainfall than regular precipitation events, while others are just a drizzle. An experiment was conducted to assess the volume of solids in runoff. I used a particle curtain to collect solids in a storm drain during rainfall events. I collected samples and analyzed them for composition and mass. The hypothesis was that a longer, heavier rainfall would bring a significantly larger amount of sediment runoff into the storm drain. The data collected supports my hypothesis that longer, heavier rainfall events cause significantly greater amounts of solids in runoff.

8. BEST SOIL FOR PLANT GROWTH FOUND IN 4 SELECTED TOWNS OF OCEAN COUNTY

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

Although Ocean County has predominantly sand as a major soil type, there are regional differences in the fractions of silt. Also, soils closer to the immediate coast tend to be greater in sand composition. The objective of this experiment was to obtain soil from four selected towns in Ocean County, then conduct a comparative growth study. The four towns were from the northern to mid-Ocean County area including: Brick, Toms River, Bayville, and Lacey. All of the soil samples were taken from a general "central location" in each town. Three planters containing two plants each were used for each town from December 29, 2011 to March 7th, 2012. Measurements on the plants were recorded every four days using a ruler (mm) by recording the length of the stem and the width of the leaves. Visual observations of the soil and plants also were recorded. Throughout the growth period, all of Brick's plant boxes had successfully produced healthy plants. However, none of Toms River's plants even sprouted. Bayville had successfully grown two plants in two of the three boxes, and Lacey grew one plant in one of its boxes. In the end, Brick's soil had proven to grow the best quality of plants in such a short amount of time.

BEHAVIORAL AND SOCIAL SCIENCE CATEGORY:

9. SYNESTHESIA: A DIFFERENT PERSPECTIVE ON THE WORLD

Rand Abdul-Raziq, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Dr. John Wnek

Imagine tasting chocolate chip cookies when listening to the violin or seeing the letter “S” as a deep blue. About 1 in 200 to 1 in 100,000 people have this condition called Synesthesia (Phillips). It is a condition where one sense is simultaneously perceived by one or more senses. An example of this is when the secondary perception is remembered better than the first. The name “Laura” can be seen as purple. In the future, the name is remembered as purple instead of Laura. This type of Synesthesia is the most common form people have in which numbers, letters and words are combined with colors. An experiment was concluded to determine symptoms of Synesthesia using surveys. Participants were asked questions that combined two different senses together. Results concluded that there were no signs of Synesthetic like symptoms. Most people related objects to past memories than to random feelings which are normally how the human brain functions.

10. MUSIC’S EFFECTS ON MEMORY

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

Many people claim to gain a positive effect from listening to music. These people often use its effects as an aid to studying. Music affects the brain in many different ways, such as the efficiency of memory recall. Many factors in music influence this effect music has on the brain. One of these factors is tempo, which is the speed at which the music is played. To test the effect of different tempos on memory, a memory test was administered using word fragments from the book Behavior Research Methods, Instruments, & Computers. The subjects were asked to complete the word fragments in groups of fifty letters. Different tests were administered using music of differing tempos or no music at all. The percent of letters the students had successfully memorized was compared between the tests. It was found that faster music stimulated memory recall more than music with slower tempos. Therefore, students who wish to gain a positive memory effect from music should choose songs with faster tempos as opposed to songs with slower tempos.

11. THE EFFECTS OF STRESS ON MOTOR COORDINATION

Adedayo Gbadamosi, Block 2 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Dr. Wnek

Have you ever wondered what makes you work? What makes your arm throw that ball or even what makes your legs move when you walk? Well that is all the magic of motor coordination. Motor coordination is the combination of body movements in order to perform intended actions. However, when one is under pressure to do these certain tasks under more challenging circumstances, stress is generated. Stress is the mental or physical anxiety and uneasiness that results from many different causes. Therefore, when stress is produced, the body must react to it. Thus, it was hypothesized that stress would directly affect the humans' performances throughout the experiment. In this experiment, whether the stress directly affects the body's performance and motor coordination was tested by having twelve human subjects complete a series of tasks in two different trials: stressed and unstressed. This study supports my hypothesis, the results suggested that stress does significantly affect motor coordination. Moreover, the study also suggested that girls are more capable of coping with stress than boys because of a lesser change in performance between the two trials. Overall, the body is directly affected by the stress generated from more difficult and uneasy circumstances.

BEHAVIORAL AND SOCIAL SCIENCE CATEGORY (CONTINUED):

12. WHICH AGE GROUP AND GENDER POSSESSES THE MOST COGNITIVE BIAS?

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

Each day, people make a myriad of decisions, some of which are affected by cognitive bias. Cognitive Biases are mistakes the brain makes due to simplified information processing that cause people to make decisions that go against reason. This study tested three age groups, of ten boys and ten girls each, to discover which age group and gender possesses the most cognitive bias. It was hypothesized that the oldest age group of men possess the most cognitive bias because they had more time to develop biases and men tend to make decisions more quickly thus allowing mental errors to occur. There were three trials, each for a different type of cognitive bias. The first trial tested the Bandwagon effect. The participants took a survey that had popular answers listed below the questions. The second trial tested the Anchoring Effect. Participants picked one Easter egg from a group of differently colored Easter eggs, some of which contained a prize or were cracked. The last trial tested The Availability Heuristic. Participants drew a number from a hat and then answered a question with a numerical answer. Bar graphs were made to compare the biased responses among the groups. It was found that the youngest boy group was the most cognitively biased because they responded with the highest number of biased answers. Therefore, boys in age group one, which is ages 11-17, possess the most cognitive bias.

13. CONCENTRATION IN LOUD AND QUIET ENVIRONMENTS

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

The automatic assumption of many is that quiet surroundings mean better work ethic and the ability to better concentrate. The question addressed in this experiment is how different environments and distractions affect focus and concentration. Flashcards with basic multiplication were used for a range of participants who were individually tested in both the settings for one minute. In this minute, they would need to answer as many problems as they could. The data was organized into different tables, seeing the percent of errors made in the different settings along with how many total were completed. It was concluded that while there is a larger chance of error in a distracted setting, the amount completed and pace had no significant difference in the different environments. The results of the trial depended on the individual and their own unique preferences and reactions, leading to the conclusion that setting and environment does not affect everyone in a single way, and showing that the type of environment has no direct relationship to the focus and concentration of all individuals.

14. HOW DOES MUSIC AFFECT SPEED, CONCENTRATION AND COORDINATION?

Devin North, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES)
Advisor: Mr. Dave Werner

All throughout history people have listened to music to help them focus on schoolwork, exercising, and many other activities. It is said that the tempo of the music can affect efficiency and the speed at which a task is completed. It was hypothesized that a person will complete a task faster if they are listening to quick, upbeat music. Ten test subjects, five male and five female, were tested by playing the game Perfection® with different genres of music and their times and observations were recorded. All of the test subjects were fourteen or fifteen years old. The genres tested were classical, dance, country, and heavy metal. Each trial done was timed and line graphs were made relating the data. The results prove that upbeat music, such as dance music, does indeed decrease the time it takes to put all of the Perfection® pieces into their correct places and aid in concentration. The hypothesis was correct. The country and classical genres increased the time because they have slower tempos, but also increased concentration. The heavy metal made the subject more unfocused, causing their time to increase. Therefore, to complete a task quickly, efficiently, and attentively, a song with a high tempo is recommended.

BEHAVIORAL AND SOCIAL SCIENCE CATEGORY (CONTINUED):

15. NUTRITIONAL MEDIA BLITZ: DO COMPANIES PROVIDE WHAT THEY ADVERTISE?

Colin Panarra, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Werner

Nutritional supplements and protein shakes are all over the media. They advertise their products in clever ways such as Gatorade's® slogan "Quench your thirst." When somebody sees this, they think that Gatorade® is an excellent hydrator. However, how is one to know if they are really buying what has been advertised to them? This leads to the question, do companies truly provide what they advertise? In order to prove this I collected fifteen products that either I have used in the past, or that classmates have used and bought because of the advertisements. I collected a variety of more common products such as Gatorade® and some lesser known products such as Vega® Sport products. In order to see if these products were accurate to what they advertised I set out and picked apart each individual ingredient of every product and researched its benefits and risks. Then, I looked at each project as a whole and compared them to what they were beneficial to and what the advertisements showed. It turned out that the more well known companies, that advertise more, had false products, that protein shakes were all non-beneficial and potentially harmful, and that lesser known companies did almost exactly what they advertised.

BOTANY CATEGORY:

16. I'M A VEGETARIAN BUT MY PLANTS AREN'T: HEALTH, DIET, AND ROUNDEAF SUNDEWS

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

The Roundleaf Sundew (*Drosera Rotundifolia*) is a tiny carnivorous plant which grows in the marshlands of New Jersey. Unlike its well-known cousin, the Venus Flytrap, it is not an active plant; it feeds by trapping small insects on its sticky leaves, then digesting its prey slowly. Most humans can be healthier based on what nutrition they take in; does the same hold true for Sundews? What species of insect is the most beneficial to the health of the Roundleaf Sundew? Eighteen Sundew plants were purchased and I placed them in staggered rows. After they had adjusted to my home, I designated three plants to each food; caterpillars, meal worms, fruit flies, grasshoppers, and chop meat. Three plants were made into a control group and were fed nothing. A UV light was added; the plants were watered as needed. I observed the plants, and it was shown that the control and fruit fly plants were healthiest. Unfortunately, the chop meat plants grew a fungus which spread to the other plants; eventually, all plants perished before significant growth could be recorded.

17. SALTWATER INTRUSION: AN INCREASING PROBLEM FOR TERRESTRIAL PLANTS

Rachel Camaligan, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Dr. Wnek and Mr. Kelsey

Many people wonder about the plants along the beaches and why they do not grow in other locations. It is because those plants are reliant on the salty water that is absorbed through their roots. As salt water begins to meld with the groundwater that humans drink, it comes to mind that people cannot consume more than a 0.3% part saltwater mix in their daily lives. This fact made me want to inquire about what will happen to terrestrial plants, like agricultural products when the mix gets over half a part per thousand. In order to solve this question, I decided to hold an experiment in which artificially mixed saltwater solutions of 1 ppt. and 0.5 ppt. As a constant, there was well water that has a salinity of about 0 ppt. After three weeks of watering the plants in planters that simulate the absorption of water through the ground and up to the plants, the experiment was complete. The data suggested that the plants with 0 ppt. salt water had the best growth, while the plants with the 1ppt salt were the most stunted. Based on the collected information, it can be concluded that salinities over 0.5 ppt. will stunt the growth of terrestrial plants.

BOTANY CATEGORY (CONTINUED):

18. DOES SOUND ACTIVITY AFFECT PLANT GROWTH?

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

People say that if plants are to grow better, give them music. But in reality, does sound activity affect plant growth? Six cups were filled with the same amount of potting soil and planted with two Impatiens seeds. These two groups of three plants were placed in separate locations. One group was exposed to music while the other was kept in silence. All the plants were watered the same amount, the same time every day. The heights of these plants were recorded daily in a data table. The recording began from the day the seeds were planted to forty five days later. Each cup was numbered from one through three for each group. Measurements were measured to the nearest millimeter. The measurements started from the surface of the dirt, and it extended to the surface of the top leaf. The group exposed to music underwent constant sound activity for forty five consecutive days, while the other group did not experience any sound whatsoever. All the plants had locations with the same temperature, and both groups had the same amount of sunlight every day.

19. TO SHADE, OR NOT TO SHADE

Taylor Donovan, Block 2 Science Class, Marine Academy of Technology and Environmental Science
(MATES), Advisor: Mr. Jason Kelsey

To many, it is general knowledge that plants need sunlight to grow. But, what some people don't know is that there are a variety of plant species that can grow and photosynthesize with a limited amount of light. These plants are considered shade-tolerant. Since a plant is a plant, it must be possible for shade-tolerant plants to survive in no shade, right? If you said yes, you would be right- to an extent. In this experiment three separate trials were carried out in which Impatiens (*Impatiens wallerina*), a shade tolerant species, was grown in three different ways. Some of the plants were grown in full light, some were grown under a 50% shade cloth, and some were grown in no light. The purpose was to see just how shade-tolerant shade-tolerant plants are. The results revealed that the plants in no light could not survive, and the plants in full and half-light were able to sustain themselves fairly well. However, by averaging out growth rates by using stem widths, it was observed that the plants in full light had a 0.2% greater growth rate than the plants in the half-light trial.

20. THE EFFECTS OF CIGARETTE SMOKE ON PLANT HEALTH

Taylor Furbish, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Dave Werner

Many people all across America smoke cigarettes on a regular basis, even though the effects of the smoke on human health are widely known. Just as humans breathe in and out of their mouth or nose, plants take in and release gas through tiny holes called stomata that transport air to other parts of the plant cell. If the only air available to the plants was cigarette smoke, wouldn't they have to absorb it into the cell? And, if cigarette smoke has such a deadly effect on humans, wouldn't it have an equally dangerous effect on plant health? For the purpose of answering these questions, nine Jack Frost Brunnera (*Brunnera macrophylla*) plants were placed in individual terrariums. Once a day for four weeks, three plants were exposed to the smoke caused by the burning of five cigarettes, and three plants were exposed to the smoke of ten burning cigarettes. The other three plants were left alone. The plants exposed to the smoke died quickly, mirroring the devastating effects that the smoking of cigarettes has on human health.

BOTANY CATEGORY (CONTINUED):

21. THE EFFECT OF ELECTROLYTES ON PLANT GROWTH

Khari Harper, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Dave Werner

Plants require basic growth parameters including sunlight, water and nutrients to be successful. Also, minerals and other growth regulators can facilitate plant growth. In this experiment, Indoor Paperwhite bulbs were used to test the effect of electrolytes on plant growth. Three different electrolytes were used on sets of three plants each to see how they change the way the plant grows in comparison to the three plants getting only water. The electrolytes used in the experiment were: potassium from an emulsion made of bananas, magnesium, and calcium both of which came from supplement pills. Over the course of five weeks the plants were periodically watered with their specific solution and measured to see height difference. The experiment found that the plants receiving a solution of magnesium grew the tallest and the most rapidly, but at different times, and the plants receiving water didn't grow as fast or as much as magnesium, but all grew at around the same amount. In potassium and calcium no plants bloomed; however, in both magnesium and the control two-thirds of the plants bloomed.

22. HOW DIFFERENT CHEMICAL SUBSTANCES AFFECT THE GROWTH OF *Hedera helix*

Chris Hartley, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Dave Werner

With the increase of air pollutant types into the atmosphere (i.e., car emissions) and increased runoff of water that contains contaminants from companies and homes that get into the soil. Plants are exposed to a number of substances that may affect growth. The purpose of my experiment was to see how different chemicals would affect the growth of *Hedera helix*, or English Ivy. I hypothesized that the nitric oxide group would have the most growth. To research my hypothesis, I set up a control group watered with purified water and four experimental groups watered with purified water plus one of the following chemicals: sugar, nitric oxide, nitrogen, or rock phosphate. The plants were given 16 hours of light a day from two sunlight-simulating bulbs, and the growth of the plants was recorded weekly for six weeks. The successfulness of the groups watered with their chemical-water mixtures was based off the amount of growth in relation the control group. My hypothesis was proven wrong by the experiment, but almost all off the experimental groups results were higher than those of the control group. The results of my experiment may carry over to other plant species and could be used to grow plants more quickly, and to possibly bring them to maturity quicker.

23. FROM SPROUTING TO MATURITY: IS THERE STILL MORE VITAMIN C?

Alexa Ornstein, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Dave Werner & Dr. John Wnek

Vitamin C, a crucial vitamin in plants, protects them from being harmed by the ozone. Also important to humans, vitamin C is consumed through many plant materials every day. But what if more vitamin C could be consumed this way through a regular diet? The goal of this experiment was to determine whether or not using vitamin C during the soaking stage of alfalfa sprouting (a quick growing plant), would have transferred the vitamin to the full grown plant. This test uses alfalfa as a possible representative plant to other plants and what they could yield at full growth. Using a vitamin C indicator solution, of which a lighter color indicated more vitamin C absorbance by plants, the juices of nine mature plants, (six of which were grown with vitamin C) were tested. The results were surprising in that the plants treated with the most vitamin C turned out with the darkest solution color and the ones treated by only filtered water had the lightest colors. Quantitative results supporting these results were found by testing for the color difference in a spectrometer at wavelengths of 620 nm and 410 nm. The results suggested a trend somewhat similar to the color difference. Thus, vitamin C uptake in alfalfa must have a threshold.

BOTANY CATEGORY (CONTINUED):

24. THE EFFECTS OF SEED SIZE ON THE GROWTH RATE OF SWEET PEAS

Brittney Ploumitsakos, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisors: Mr. Dave Werner and Dr. John Wnek

Seed size is a simple characteristic that many people do not take into consideration when planting gardens. This characteristic; however, may be a reason for these plants to grow faster, or not grow at all. This study was done to see if there is a correlation between the size of a seed and the growth rate of the seedlings. It is hypothesized that the bigger the initial seed size of the sweet peas, the faster the growth of that plant. During this experiment, ten seeds were measured and tested, each getting the exact same amount of light and water, making the seed sizes the only variable. Each week, the plants that showed any type of growth were measured, and those measurements were recorded into a log. Each plant showed a different growth rate: the larger the initial seed size was, the faster the growth rate of the plant is. After reviewing the data, it was concluded that the hypothesis was correct, and the initial size of the sweet pea's seeds does affect the growth rate of these plants.

25. THE EFFECTS OF ADDING SUGAR TO THE DEVELOPING PLANT *Pisum sativum*

Nick Roma, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Mr. Dave Werner

A common myth states that adding sugar to plants will help them grow. This experiment observed the effect of adding both raw and processed sugar as opposed to no sugar to measure any difference in the rate of growth or the size of the plant *Pisum sativum* after two weeks. Nine plants, three for each test, were placed in a closed room at 19.0 degrees Celsius. The plants received 12 hours of artificial sunlight and were watered twice, daily. After testing for two weeks, it was concluded that the application of sugar to plants *Pisum sativum* would stunt growth and kill the plant. Control plants 1, 2, and 3 had all sprouted and grown while Raw Sugar plants 1, 2, 3, and Processed Sugar plants 1, 2, and 3 had not even begun to sprout. While discarding the dead specimens after the test was concluded, mold was observed developing on the seeds of the dead plants. This was believed to have come from the combination of sugar being left out and the plants dying and not related to the actual death of the plants. The results of this experiment show that the myth of adding sugar to plants to induce rapid growth is false.

26. THE EFFECT OF CLEANING PRODUCTS ON HOUSEHOLD PLANTS

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

The health of our environment is very important. Every time you use any cleaning product, you are exposing your household plants to these harsh chemicals. The goal of this experiment was to determine what the impact of household cleaners were on the environment or if they had any impact at all. Twelve identical plants were purchased and put into four separate groups. The groups were as follows: the control group (which were not tested at all), the Windex group, the Clorox Bleach group and the Green Works group. Each plant was grown without the cleaner for three weeks, then for three more weeks they were sprayed with their corresponding cleaner. After each week the height of the plant was measured using a ruler. The hypothesis was, out of the three products; Clorox® Bleach, Windex®, and Green Works, Bleach would have the most negative affect on a plant. This hypothesis was proven correct. After each plant was measured and their declines in height were calculated, the measurements were then averaged together and Bleach came out with the greatest decline overall.

BOTANY CATEGORY (CONTINUED):

27. HOW DIFFERENT SALINITIES AFFECT THE GROWTH, COLORATION, AND HEALTH OF WHITE RIBBON PLANTS

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

White Ribbon plants, *Dracaena sanderiana*, are freshwater plants that cultivate in bodies of freshwater such as bogs, lakes, rivers, streams and ponds. Due to global climate change, higher sea levels are being produced from melting glaciers. This causes salt intrusion into previously areas of freshwater, affecting the vegetation that is found there. In this experiment, White Ribbon plants were subjected to different salinities in order to determine the effect of salt on freshwater plants. There were three groups, each having three individual plants, of salinity qualities. The first group had a salinity of 0 ppt. representing freshwater, the second having 25 ppt. representing bay water, and the last having 35 ppt. representing ocean water. Over time, the salt negatively impacted features of them such as the growth, coloration, and overall health. After being analyzed, the observations were used to determine which salinity group was affected the most. The White Ribbon plants grown in the saltwater representing ocean water was negatively influenced more than the freshwater and bay water groups.

ENGINEERING, MATH AND PHYSICAL SCIENCE CATEGORY:

28. DIFFERENT GRADES OF GASOLINE AND HOW THEY AFFECT AN ENGINES PERFORMANCE

Joseph Burns, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Dave Werner

Engines have been around for decades upon decades, and are substantially important for everyday human life. From driving down the street, to mowing the lawn, to even cutting through cement blocks, engines are everywhere. In order for these engines to work properly, an adequate fuel supply must be available for the combustion process to take place. Present day engines use a fuel that is known as gasoline which contains octane. Octane is a flammable hydrocarbon liquid that along with other hydrocarbons (pentane, hexane, heptane, and many others) is refined from crude oil and make up the blend of chemical components called gasoline. When a gasoline is referred to as 87 octane (regular) or 93 octane (premium), this shows what the percent of octane is in the gasoline sample. Trials were conducted to test to find out whether there were any differences between the combustion rates and maximum temperature the engine reached using different types of fuel with different octane levels. It was theorized that the 93 octane (premium) gasoline would perform the best in all cases. Three different types of engines were used in the experiment; two are very common 4hp engines, and a larger 13hp engine. Data was recorded in the form of tables and charts, comparing the data of each trial closely. The hypothesis was later rejected when data was analyzed, and it was concluded that premium burns at lower temperature, and does not burn as long as regular. Therefore, regular gasoline is the most efficient gasoline to use in an engine.

ENGINEERING, MATH AND PHYSICAL SCIENCE CATEGORY (CONTINUED):

29. WIND INSTRUMENTS INTONATION AND AGE

Danielle Demateis, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Dave Werner and Dr. John Wnek

Intonation is the manner of producing musical tones, specifically the relation in pitch of tones to their key or harmony, or the degree of adherence to correct pitch. Good intonation implies close approximation of the pitch; poor intonation implies deviation from pitch. In order for an instrument to have appealing sound quality, the instrument must be in tune. Being in tune means that pitch /tone of the instrument is not too high or too low. To tune an instrument, a chromatic tuner is used that tells how many cents sharp or flat an instrument is. Many factors can cause an instrument to go out of tune; one of these factors is age. As an instrument gets older, the instrument can warp, which affects intonation. However, this is not the only contributing factor. In this experiment, the 30 wind instruments of various ages were tested to test the hypothesis of whether or not age affects intonation directly. The hypothesis was proven false; it was found that not only age contributes to an instrument going out of tune.

30. THE PHYSICS OF ARCHERY

Alex Eisenschmied, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Dr. John Wnek and Ms. Kelly Zatta

Density and mass have a large effect on how much is generated by a projectile. In archery, this can have a large impact on how well you shoot, or how effective your shot is taking down a target. My test measured velocity and impact force of four different materials commonly used in arrows for archery. I gathered data using a chronograph and tape measure, as well as a scientific balance. Arrows were shot through the chronograph, into the target that was set up. Then, I measured the length of the arrows that were in the target, to see how far they penetrated. After following this procedure, I was able to conclude that carbon fiber arrows had the highest velocity and depth of penetration.

31. IS A SUPERSONIC PLANE DESIGN MORE EFFICIENT SOUND-WISE THAN A GENERIC PLANE?

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

Planes are obviously an extremely useful way of transportation in today's life. They have made travel from one end of our country to the other from a few days to a few hours. Although plane travel seems so positive and amazing, it has its drawbacks that include cost, environmental footprint, and the sound created when traveling through the air. As a commuting plane goes overhead, it creates a low deep sound that lasts for several seconds and slowly gets quieter as the plane moves into the horizon. Now what if that plane was going faster than the speed of sound? That quiet deep tune of the plane would turn into a violent second that makes your ears feel like their bleeding. This commonly known phenomenon is known as a sonic boom. A sonic boom occurs when an object passes the speed of sound. The production of sonic booms has been a problem ever since the sound barrier was first broken. For obvious reasons, there is a sound limit that the planes can produce when traveling because it would disrupt the people on the ground in their everyday life. In this study, a modern day commuting plane is put up against a preferred supersonic plane design to see which is more sound-efficient.

ENGINEERING, MATH AND PHYSICAL SCIENCE CATEGORY (CONTINUED):

32. THE GOLDEN RATION AND ITS EFFECT ON THE PERCEPTION OF BEAUTY IN FACES

Julia Myrovych, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Dave Werner

The Golden Ratio, also known as "phi," is found throughout the natural world. A line segment connecting two points A and B is said to be divided by a third point P if the ratio of the whole length AB to the length of AP is the same as the ratio of the length AP to the length PB" ("golden ratio" 1). This ratio is often utilized in architecture in order to create aesthetically pleasing structures. The Renaissance man, Leonardo Da Vinci, was so fascinated with this ratio that he wrote a book called the Divine Proportion in the honor of this mathematical relationship. The practical implications of this golden ratio are endless; architecture, plastic surgery, dental aesthetic surgery, and much more. Is it possible that the more a person's features approximate the golden ratio, the more attractive they are? In the survey that was conducted, the theory that people with faces that approximate the golden ratio are considered more beautiful was tested.

33. DID THEY WIN? ...OR, DID WE JUST RUN OUT OF TIME? – AN ANALYSIS OF SPORTS SCORES

Andrew Pidduck, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Dave Werner and Dr. John Wnek

Vince Lombardi's claim, "We didn't lose the game; we just ran out of time," may have been true. How well are sports designed to select a winner based on superior skill rather than chance? This project explored the games of volleyball, basketball, and ping pong and the role that chance plays in their winner selection. Simulations of games were performed, and actual game statistics were gathered and reviewed. Results were compared to theoretical statistical explanations. Recommendations were made to improve methods for determining the winning team based on superior skill while reducing the possibility of selection based on chance.

34. COASTAL WEATHERING EFFECTS ON SOLAR PANEL EFFICIENCY

Jacqueline Poglodek, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Dave Werner and Dr. John Wnek

Solar panels increase the amount of energy used from the sun, thus conserve electricity. A common misconception is that all solar panels always absorb sunlight at full capacity. But what about when there is a coastal rain shower, or when it is breezy on an autumn afternoon? How does the weathering of solar panels and other environmental factors affect the efficiency of the solar panel? Leaves, dirt, and salt can get build up in the corners of the panels, which reduces and/or prevents sunlight from illuminating the entire panel's surface. The purpose of this study was to determine the effects of weathering and seasonal variations on the efficiency of solar panels. By using a model simulating the function of solar panels on the roof, I was able to vary the conditions the panels were exposed (i.e., simulate salt water exposure, wind-blown particles, and leaves). UVB bulbs represented the sun, which were used as light sources for the solar panel, connected to a voltage meter. By comparing voltage output, this study suggests that leaves block most of the panel, while salt water limits the energy usage; however, loose particles of dirt only cover the panel slightly more than salt. Overall the leaves prevent the most light to illuminate the solar panel, lessening its energy efficient quality.

ENGINEERING, MATH AND PHYSICAL SCIENCE CATEGORY (CONTINUED):

35. WHAT TYPE OF ROAD SURFACE IS MOST EFFECTIVE IN GENERATING HYDROELECTRICITY USING CONVECTION CURRENTS OF WATER IN INTEGRATED PIPES?

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

In today's society, most methods of generating electricity cause carbon-based pollution. Scientists have determined that they can reduce the amount of carbon based pollution by replacing large-scale generators with environmentally friendly small-scale generators. Scientists at the University of Rhode Island considered incorporating water-filled pipes that extend from a roadway up into a stream or river. The roadway would heat the pipe and the stream or river would cool it. This forms a convection current that can be used to spin a turbine, which would generate electricity. The experiment involved testing the efficiency in asphalt, concrete, and dirt roadways. It was expected that this generator would be most efficient in an asphalt roadway. This experiment was done on a small-scale model. In the experiment, a closed-circuit pipe system was incorporated through models of asphalt, concrete, or dirt roadways and a stream model. Each roadway model was heated. Then the temperatures of two pre-determined points on the pipe were measured. The result of each trial was recorded as: $[\text{Temperature of Point 1} - \text{Temperature of Point 2}]$. The higher the result of the expression is, the faster the convection current is moving, which means that an incorporated turbine would generate more electricity. The results showed a significant difference among the three roadway models. Trials with the concrete roadway produced the greatest convection.

36. THE STORM DRAIN EFFICIENCY ASSISTANT

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

Storm drains are more important than people tend to acknowledge. They make sure streets stay safe from flooding, keeping them mostly dry. However, if one were to collapse or clog it would be devastating. Water would back up and flood the streets. In addition, if it collapsed, the ground above it would sink which is potentially dangerous in spots where it runs under roads. To avoid these tragedies, storm drains must be checked regularly. This job is dangerous and disgusting, but it is entirely necessary. By having a machine do the job instead, operated by only one person instead of a team, it would be much more efficient, save money, and produce better all around results. The prototype made displays a model of an efficient robot with minimal parts to be cost effective. If this were to be made into a working mechanism it would greatly increase productivity.

36-A. SOLAR ENERGY REFLECTION

Brandon Johnson, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Dave Werner

In today's growing world, people are looking for easy ways to create heating in their homes while remaining cost savvy. Current building types use one of four main siding types, each with their own specific properties and costs: cement, wood, vinyl, and aluminum. The two most common materials used are aluminum-vinyl or cement in residential or commercial areas. Conducting a series of tests involving measurements of solar energy reflection (heat and light), a group of scientists concluded that the cement reflects the majority of solar energy over longer periods of times, conducting a larger amount of heat in cooler climates, while the aluminum-vinyl is fairer for moderate climates. However, cost can cause a misuse of either materials, as well as durability and health issues.

ENVIRONMENTAL SCIENCE CATEGORY:

37. EFFECTS OF WATER EROSION ON SOIL AND SAND

James Bond, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Jason Kelsey and Dr. John Wnek

People have questioned what is better to build property on, sand or soil. There are certain advantages to both, but it has been unclear which is more stable after water erosion has occurred. One argument insists that the soil will turn into mud, which causes mud slides; while another argument suggests that because sand is so small, after some water erosion, everything on it will fall in. To conclude what erodes the most, an experiment was conducted by simulating rain on a certain amount of sand and soil. The difference between the original height and the new height, along with the difference between the original volume and new volume, of both sand and soil was determined. This was to conclude which would be more eroded by rain. After examining the data, it was concluded that the sand's erosion damage caused more of the sand to be moved than the soil.

38. ACID RAIN VS. NEUTRAL RAIN, DETERMINING WHICH CAUSES MORE DAMAGE TO EXTERIOR BUILDING MATERIALS

Spencer O'Donnell, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Dave Werner and Dr. John Wnek

The average building is subject to acid rain at one point or another. Some locations receive more acid rain than others (i.e., NYC). Acid rain clearly affects buildings by causing damage over time, but how much more damage does acid rain cause in comparison to regular rain? This experiment was conducted to simulate acid rain events and how they affect building materials. Three groups of seven materials (vinyl, concrete, clay, fiber cement, cedar, limestone, and asphalt roof material) were subjected to neutral pH water exposure, acid rain (pH < 4.0), and one set was not exposed to water at all. Over a four month period, the materials were tested against simulated rainfall. All of the tested materials were kept at the same temperature and were given the same amount of dry periods and wet periods. My data suggests weather exposed materials appeared to have damage that changed in correlation with the exposure type; however, the acid tested materials displayed significant damage in comparison with the neutral pH exposed materials. My data also suggests that cedar becomes the most visibly damaged with acid rain exposure. These results may provide builders with a better understanding of which materials to use as we continue to experience acid rain precipitation.

39. THE DEGENERATIVE EFFECTS OF MOTOR OIL, FERTILIZER, AND PESTICIDES ON *Microciona prolifera*

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

The intrusion of motor oil, pesticides, and fertilizer into the environment of *Microciona prolifera* is possibly linked to the deterioration of its health. This experiment was used to demonstrate how long a Red Beard Sponge would survive in an enclosed environment contaminated with a set amount of pollutants. The sponge samples were put into five-gallon salt water tanks with a salinity of twenty five parts per thousand. A set amount of motor oil was put into one tank, while the other tank contained a sponge with a set amount of a fertilizer and pesticide combination. Two trials were run with different set amounts of pollutants to find a differentiation in life expectancy. Results showed that the life of expectancy of a red beard sponge in such an environment was generally low; the average lifespan of the sponges in motor oil was seven days, and the average for the fertilizer and pesticide mixture was nine days. These results demonstrate the possible effects of runoff pollution to the health of *Microciona prolifera*.

ENVIRONMENTAL SCIENCE CATEGORY (CONTINUED):

40. WHAT IS THE EFFECT OF DIFFERENT TEMPERATURES ON OIL-EATING BACTERIA?

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

Oil-Eating bacteria have existed naturally in the Gulf of Mexico for thousands of years. They eat away at the hydrocarbons that make up oil naturally. Sadly, the Gulf coast is not the only place that oil spills occur. This experiment was to see if these bacteria could be the solution to all of these oil spills. Three separate containers were sterilized and filled with filtered water with a Ph of 7.5 and motor oil. Then the bacterial mix was added. One container was labeled "Cold" and this container was put in the refrigerator to be maintained at a constant 40°F. Then the second was labeled "warm" and it was placed in a room and kept at a constant 70°F. Over a ten-day period, the mixture was observed and any bacterial growth or decreases in oil levels were recorded. It was noticed after just 24 hours, bacteria had already started to grow in the warm water, yet there was no growth in the cold container. Over the ten days, bacterial growth in the warm water was constant and after 10 days the oil was gone yet no bacteria had grown in the cold container.

41. METAL ROOFING TYPES CORRODED BY ACIDIC PRECIPITATION

Jonathan So, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Dr. John Wnek

Acid precipitation corrodes the roofs of metal buildings. Formed by sulfur dioxide and nitrogen oxide emissions, acid rain is not only a problem to wildlife, but also to architects. During corrosion, the metals lose mass. However, some metals resist corrosion better than others, so it has been hypothesized that cheaper metals such as steel and aluminum would deteriorate heavily under acid rain due to certain characteristics. By creating a simulated sulfuric acid rain substance and submerging different metals in it for 30 days, it was found that steel and aluminum are the least affected by acid precipitation, while heavier metals, such as galvanized zinc, lost the most mass. This means that metals will be able to support less weight if they lose more mass, meaning that a roof built out of that metal will be more likely to break under heavy weight.

42. THE EFFECTS OF MOTOR OIL AND DETERGENT ON SHORE SHRIMP

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

After an oil spill, the main method of oil spill cleanup is using detergents to break down the oil. However, this has become a controversial issue due to the adverse effects of detergents on human health, the environment, and marine wildlife. Are detergents more harmful than the oil itself? To test this hypothesis, an experiment was conducted to simulate an oil spill and oil spill cleanup. Accordingly, the purpose of this experiment is to observe the adverse effects of dishwashing detergent on shore shrimp (*Palaemonetes vulgaris*) and determine whether it outweighs the harmful effects of motor oil. It was observed that more shrimp died in the tank that was exposed to detergent than the tank that was only exposed to motor oil. In addition, the shrimp exposed to detergent had a shorter lifespan. Interestingly, by the end of the experiment, there was the same number of shrimp still alive in the tank with motor oil as the tank without motor oil. It is concluded that motor oil does not have as great of an effect on shore shrimp than detergent does. The data suggests that the combined mixture of motor oil and detergents are more harmful to shore shrimp than motor oil itself.

ENVIRONMENTAL SCIENCE CATEGORY (CONTINUED):

43. SOIL INFILTRATION AND SOD

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

Soil infiltration levels are different from region to region, causing multiple problems such as surface runoff and erosion, and layers of grass may just add to the problem. How much does sod decrease the infiltration rate of top soil? This was tested by setting up tubes with soils from different regions of New Jersey, both with and without a layer of sod. At different times, water was poured into the tubes in advance to produce a simulation of previous rainfall. After a certain amount of time, water was poured through the tubes and the water that went through was measured as the infiltration rate. The rate was then calculated as milliliters per inch of soil in a 9 inch sample, finding the differences between samples with and without sod. It was discovered that the closer the test was to previous "rainfall", the greater the layer of sod affected the soil's infiltration rate. Therefore, it can be concluded that the grass and other plants considered sod can increase chances of runoff and other related factors in certain conditions."

44. REMOVING MAJOR CONTAMINANTS IN SURFACE AND DRINKING WATER

Tony Zheng, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Dave Werner and Dr. John Wnek

Water is an essential resource for life and clean drinking water is a key, therefore removing contaminants in water is vital. This project focuses on water quality and the detection of contaminant (i.e., copper, bacteria, nitrates, etc) in national water bottle brands, natural surface water, and other tap water found throughout Ocean County, N.J. The study includes the construction and effectiveness of a homemade water filter that can successfully lower contamination levels. Contamination levels were determined by using colorimetry, testing Cl, NO₃, SO₄, Br, Cu, and PO₃ ions. I also tested the filter's effectiveness to reduce bacteria levels using a Coliscan Easygel technique. The filter is comprised of five steps of purification. Polluted water enters the filter and reaches a sand cartridge that filters out nonorganic and larger particles. Then, it goes through a carbon cartridge that further eliminates nonorganic and organics. Next, CO₂ is inserted to further reduce organic levels. Afterward, the water enters an ammonia remover to reduce all ammonia related contaminants. Finally, it goes through a calcium chamber to increase pH, which was lowered by the CO₂. Results suggest that high of chlorine lead to lower bacterial levels. However, chlorine was not used in my filter due to health related problems. Instead, Carbon dioxide was determined to be an effective substitute, used along with calcium carbonate to maintain proper Ph balance for drinking water. Overall, the capabilities of a homemade water filter were demonstrated and it proved to be effective while being cost and energy efficient (EPA.gov).

HEALTH, FORENSICS, AND SPORTS PHYSIOLOGY CATEGORY:

45. WHICH GRIP CAUSES THE LEAST MUSCLE FATIGUE ON THE TENNIS SERVE?

Monica Chang, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Werner

Every sport causes muscle fatigue. In tennis, the serve can cause muscle fatigue in the hand, wrist, or forearm because people might not be holding the tennis racquet correctly while serving. The three main grips for tennis is the Continental grip, the Eastern-forehand grip, and the semi-Western grip. So which one causes the least muscle fatigue while serving? It was hypothesized that the Continental grip would be the best grip for serving. Twelve test subjects, six experienced tennis players and six non-experienced tennis players were tested by first doing the ruler drop test and then serving twenty times with the Continental grip one day, serving twenty times with the Eastern-forehand grip the next day, then serving twenty times the next day with the semi-Western grip. After each time the test subjects served twenty balls, they took the ruler drop test to measure the fatigue. The results prove that Continental grip causes the least muscle fatigue in the hand and wrist. Semi-Western grip resulted in the most muscle fatigue.

46. HOW DIFFERING DRINKING CUP MATERIALS AFFECT BACTERIAL REMNANTS

Rachel Jasaitis, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Dave Werner and Dr. John Wnek

Drinking cups- glass, plastic, ceramic mugs, glazed stoneware, and even metal canteens- play a role in daily life. Most people reach for the nearest cup in their cabinet and fill it up, thinking nothing of what bacteria it may harbor from the previous use. Well, it's been dish washed, right? That may not matter- some cups may retain more bacteria after washing than others. In this study, various drinking cup materials were tested for bacteria left over after use and dish washing. The test subject drank water from each of the different cups after eating and an initial bacterial swab was taken. After being dish washed, bacterial swabs were taken again to identify the remaining bacteria colonies still on the cups. Disproving the hypothesis, the plastic cup was clear of any significant bacteria growth after the cups had been dish washed. Glass and metal, on the other hand, retained 8 out of 18 colonies of bacteria after dishwashing- more than three times the natural bacteria levels from dishwashing. Plastic, ceramic and stoneware are more sterile options that should be considered.

47. THE EFFECT OF BITTER MELON TEA ON BLOOD SUGAR

Joshua Kalalo, Block 3 Chemistry, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Jason Kelsey

For thousands of years, bitter melon (*Momordica charantia*) has been used as an herbal treatment. Previous studies involving bitter melon have demonstrated that the seeds and fruit are effective in lowering blood sugar. In this study, *M. charantia* leaves were utilized to make a tea. The hypothesis is that the leaves can lower blood sugar when ingested as tea. Each trial is a variant of the oral glucose tolerance test (OGTT) and lasted for 3 days while the blood sugar level of 27 participants, each of whom is eighteen years old or older, was monitored. Each participant took part in one trial each. On days 2 and 3 of each trial, the subjects drank a sugar solution and, on day 3, bitter melon tea. Collected data was then analyzed. The overall data of day 3 showed a much lower rise in blood sugar after subjects drank the sugar solution then on day 2, showing that bitter melon leaves, when tea ingested as tea, can lower blood sugar, thus proving the hypothesis correct.

HEALTH, FORENSICS, AND SPORTS PHYSIOLOGY CATEGORY (CONTINUED):

48. EFFECTIVENESS OF FULL-STRENGTH VS. DILUTED HAND SANITIZER AGAINST BACTERIA

Christina Klein, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Dr. John Wnek

Alcohol-based hand sanitizers usually contain at least 60% alcohol as their active ingredient. However, considering alcohol dries out the skin, is this too much alcohol? The study was conducted to determine if hand sanitizer is as effective when diluted. In order to test this, I took water samples from a location full of fecal coliforms (a type of bacteria) and mixed them with the appropriate medium and allowed them to incubate in agar plates for 24 hours. The next day I swabbed one plate with full-strength hand sanitizer and the other with a diluted sanitizer sample. The results showed that full-strength hand sanitizer is more effective at killing bacteria than diluted sanitizer, so when buying hand sanitizer it is important to make sure that it contains at least 60% alcohol.

49. CAN USING HAND SANITIZER BE AS EFFECTIVE AS WASHING YOUR HANDS?

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

People everywhere have started to use antibacterial hand sanitizer as a replacement for washing their hands. In schools, workplaces, and even in public restrooms we see sanitizer dispensers placed in convenient locations so we don't have to use the sink and wash with soap and water. Because hand sanitizer plays such a big role in many people's everyday hygiene, I felt it very important to see if it actually does its job. All of these brands claim to kill virtually all germs and keep your hands clean, but, as we know, washing your hands at a sink using warm water and a little bit of soap does the exact same thing. Or does it? This experiment was designed to determine whether the effectiveness of hand sanitizer measures up to the effectiveness of washing your hands. In other words, does using an antibacterial hand sanitizer clean your hands and protect you from getting sick as well as a good hand washing?

50. CSI VS. REALITY: FACT OR FICTION?

Megan Tumpey, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Dave Werner and Dr. John Wnek

Criminal investigation shows like CSI make it appear simple to lift and identify latent prints at a crime scene. It is hypothesized, however, that the results obtained from latent prints on television media are unrealistic and highly exaggerated. To determine the effectiveness of obtaining prints and the reliability of such prints, the use of bichromatic dusting powder and a fiberglass brush was recommended. The results, compared and analyzed through digital computer analysis, indicated that television shows belittle the effort put into handling latent fingerprints. Prints are more difficult to locate, lift, and identify than implied. They are fragile and are affected by their environmental and physical surroundings.

MARINE SCIENCE AND METEOROLOGY CATEGORY:

51. SPONGE REGENERATION: THE INFLUENCE OF pH AND TEMPERATURE

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

Sponges and other marine life are a vital part of the marine ecosystem. They filter large quantities of water every day, which organisms that live in that ecosystem use to survive. Sponges live in freshwater and salt water environments. Although, sponges sometimes die off, due to nudibranchs or harvesting, there is a shortage of sponges, it doesn't matter right? Since sponges are in decline in aquatic habitats through harvesting, we may need to re-introduce sponges so that we could help to maintain a water quality balance. To determine better methods to grow sponges, I conducted this study using Red Beard Sponges (*Microciona prolifera*), a tropical species of sponge. In this study, sponges were taken out of their habitat and divided into two equal pieces. The regeneration at different pH levels were recorded daily and a final recording until death. Disproving the hypothesis, sponges grew faster in warmer water with lower pH levels. The cooler the temperature became, the slower the sponges grew but the longer the sponges stayed alive. Species may live longer in cooler climates, but the species may be able to grow faster in warmer climates, so if an animal can survive a very warm climate, it may be able to grow rapidly and have an abundance of its species. This may be important for sponges as the earth warms as a result of Global Climate Change

52. GROWTH OF ALGAE IN DIFFERENT ENVIRONMENTS

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

There are many species of algae, both beneficial and harmful, but with the current energy crisis going on many people have turned to this under water protist to produce oil for cars. Six tanks were divided into three environments, with six different surfaces in each tank. The alga was then grown, and data was recorded in different charts. Analysis of the trend showed that algae was mostly produced in stable temperatures with UV light radiation from above. The material that received the most algae growth was smooth stone, and the material that received the least was the disposable plastic and the metal. Therefore, this study suggests that algae tends to grow best in smooth, stone or glass like structures.

53. THE EFFECT OCEAN TEMPERATURES HAVE ON AIR TEMPERATURES

Alexis Del Vecchio, Block 4 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Dave Werner

Every year I enjoy the splendors of living by the ocean, cooler summers and warmer winters, but no matter how hot the day was the water was always freezing. I wondered if that was why the summers were cooler and winters were warmer because, while the ocean didn't stay a consistent temperature, the temperature did not deviate much throughout the year. If the water temperature affected the air temperature then the air temperatures by the water would change less than inland air temperatures. Water absorbs a substantial amount of energy before releasing it so in the summer the water might trap some of the heat. While, in the winter, the water currents carry warm water to the area but heat doesn't stay anywhere for long as it goes from a warmer place to a colder one. The experiment is to see if there is a direct correlation between air temperatures and water temperatures.

MARINE SCIENCE AND METEOROLOGY CATEGORY (CONTINUED):

54. IS THE ACTIVITY LEVEL OF SEA STARS AFFECTED BY LIGHT?

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

Sea stars, or *Asterias rubens*, have been known to hunt at night, but why is that? Are they really most active in darkness, or is there a certain light in which they will prefer to move around in search for food? This experiment was conducted to see which light (natural or artificial and low or bright) would have some effect on the behavior of a sea star. The wavelengths of each kind of light- heat lamp, black light, fluorescent light, and sunlight- were also taken into account. For each trial of lighting, the amount the sea star moved and ate in a 30 minute period was recorded. The most movement was recorded in a trial of no light, and the least being in a trial using the fluorescent bulb. The results show that they prefer less light to more and natural to artificial, and they are affected by different lighting even in captivity.

55. FOOD PREFERENCE OF THE SHORE SHRIMP, *Palaemonetes spp.*

Bryan Neff, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Dave Werner and Dr. John Wnek

The common shore shrimp (*Palaemonetes spp.*) is commonly found along the Atlantic and Gulf shores in estuarine environments. It is commonly used as bait for fishing or as feed for larger captive marine species. I conducted an experiment testing the eating preference of a subject pool of ten individual shore shrimp. Being that the common shore shrimp is an omnivorous scavenger, three different types of food were fed to the shrimp. The food chosen was based on what they would have encountered in their natural environment. All three types of food were placed in the tank and the number of shrimp that began feeding on a food type were counted for each respective food type. The food used in the test were an algae mix, deceased white shrimp (*Litopenaeus setiferus*), and the Atlantic silverside (*Menidia menidia*). After five tests, it was shown that the shore shrimp prefer the feed on the deceased white shrimp most often.

56. WATER'S SALINITY AND ITS EFFECT ON COPPER

Ryan O'Shea, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisor: Mr. Dave Werner

Copper is a common metal with many different uses in the modern world. Copper is a good choice for piping material, but it is still affected by water. It was theorized that the higher the salinity of the water, the more the copper would be affected. Three identical strips of copper were placed in exactly 125 ml of tap, brackish, and ocean water. Data was recorded at the end of the experiment in the forms of charts and pictures. Analysis of the data showed which water sample had the greatest effect on the copper. The hypothesis was proven to be correct with ocean water having the highest salinity and the greatest effect on the copper strip. A water sample with the highest of the group was able to cause the greatest change in the copper strip.

MARINE SCIENCE AND METEOROLOGY CATEGORY (CONTINUED):

57. THE STRUCTURAL DAMAGE OF WOOD AFTER SUBMERSION IN SALT WATER

Julia Ott, Block 2 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisor: Mr. Jason Kelsey

Wood is a hard, fibrous material used by humans to build many of our worlds most wondrous structures. Wood is used for creating many things such as docks and decks. Many people claim that the wood used to build their dock or their deck will never become damaged or weaken over time because they say the wood was made to withstand the abuse of the waves. However, when it comes to water damage, it can happen to anyone's property. When water is in direct contact with a wooden substance, it can cause changes in the structure and appearance. The damage to the wood can progress from minor to severe damage in only a few days. According to the conducted strike tests, the wood becomes very soft and heavy. The wood had absorbed a distinct amount of water, roughly a gallon. Also, the physical appearance of the lumber changed as well, turning darker or lighter. After careful examination of the data, it was shown that the wood was, in fact, damaged. Whether it is Trex, Water Repellent Treated Lumber, or even Douglas Fir, the wood will weaken over time.

58. OCEAN ACIDIFICATION: THE EFFECT ON CALCIFYING ORGANISMS

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

The emission of carbon dioxide into the environment by humans has been proven to be linked to the deterioration of the shells of marine species. This experiment was performed to demonstrate the increasing rate of ocean acidification on marine life which was performed using the shells of Northern Whelks, Blue Mussels, Atlantic Bay Scallops, and Atlantic Surf Clams. The samples of the shells were put into different buckets with varying pH, depicting the future pH of the ocean. A set pH was put into one each bucket, from the current rate to a prediction of what it will be in 300 years. The shells were taken to the school weekly, and the mass was recorded in grams, showing the percent of change from each week, and therefore depicting a probable rate. Results showed that the outcomes are violent, and that the deterioration of shells will significantly increase if the government keeps ignoring this issue. These results demonstrate the drastic effects of ocean acidification caused by human pollution to the health of marine species.

59. CORRELATION BETWEEN PRECIPITATION AND TURBIDITY IN THE MANASQUAN RIVER

Rachel Selsky, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES), Advisors: Mr. Jason Kelsey and Dr. John Wnek

The Manasquan River meanders through diverse locations with varied terrain: forest, wetlands and suburban developments, and widens as it approaches the Atlantic Ocean. Turbidity levels of the river water are affected by construction along and near the river, road runoff, and fertilizers. Water samples were collected weekly from 6 distinct sites where these factors would most likely be present. Weather conditions and water levels were noted. The study supports that, in addition to the previously stated causes, the turbidity correlates more with the substrate than recent precipitation and human interference. In areas where the river bottom is sand the water clarity was higher than in areas where the banks were mud, detritus or clay. Those locations were murkier. The turbidity fluctuated directly with the water level, which means that the turbidity increased as the water level did.

MARINE SCIENCE AND METEOROLOGY CATEGORY (CONTINUED):

60. HARD CLAM GROWTH IN LITTLE EGG HARBOR: 500 YEARS AGO AND TODAY

Lauren Zodl, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Dave Werner and Dr. John Wnek

Mercenaria mercenaria, more commonly known as the hard clam, has been an important food source from Little Egg Harbor since the time of the Leni Lenape Indians. The Lenape Indians discarded unwanted shells in mounds called shell middens: one of the largest is in Little Egg Harbor. Every hard clam records information about the growing conditions of its time in its shell. The size of its annual growth ring is dependent on the quality of the growing season and will show if any environmental changes have affected it. Taking a cross section of the shell allows you to determine its age by counting the annual growth rings. This experiment was conducted to determine if the growing conditions differed for the hard clam 500+ years ago compared to the growing conditions of today. The height of the clams, from both time periods, was compared to its age to determine if the hard clams from different times grew at different rates. The data suggested that there was not a significant difference in the growth rates of these two sets of hard clams. From the data we can conclude that growing conditions for the hard clam during the time of the Lenape Indians 500+ years ago are similar to those of today.

ZOOLOGY CATEGORY:

61. THE EFFECT OF PESTICIDES AND FERTILIZERS ON BRINE SHRIMP

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

Pollution is one of the most drastic problems affecting marine wildlife such as the brine shrimp, *Artemia sp.* The purpose of this project was to test two common pollutants, fertilizer and pesticides, on the lifespan of brine shrimp. This would demonstrate which of the pollutants would be the most detrimental to the life of brine shrimp. This experiment could also begin to shed light on how these chemical pollutants might affect other forms of marine life. The brine shrimp were contained in three separate tanks under the same conditions. One tank had the fertilizer, one had the pesticide, and one had neither as it was the control. The same numbers of shrimp were in each tank, and the remaining live ones per tank were counted every hour. It was hypothesized that the pesticide would shorten the shrimp's lifespan the most. The results refuted the hypothesis. It was actually the fertilizer that shortened the shrimp's lifespan the most. It was also impressive how long the shrimp in the control tank lived compared to the rest of the shrimp.

62. THE EFFECTS OF BPA ON ROSY RED MINNOWS

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

Water bottles play an important role in supplying water to people all over the world. They are an important source of clean water when clean water from other sources is not available. However, they make leak Bisphenol A (a chemical used in the manufacturing of plastic that acts as an artificial estrogen when exposed to high temperatures). (This could come from leaving them out in the sun to long). The experiment I preformed was to see the effects of BPA from water bottles on rosy red minnows (*Pimephales promelas*). I took two controlled tanks containing rosy red minnows, added heated water bottles into one tank (stimulating the release of Bisphenol A), and kept the other tank as the control. I then observed the results and recorded the data. This experiment analyzed the effects of BPA regarding the mortality and behavior of the fish. It was concluded that adding low doses of BPA did not affects the mortality of the fish but did change their behavioral patterns, showing that while not deadly, it is still is a serious problem. The applications of this are, we should avoid BPA because of the excess estrogen it makes for our body. This will change our behavior patterns and may lead to serious health problems. This is a problem because humans and multiple animals are exposed to BPA daily. We should limit our exposure by not leaving water bottles in the sun and by not microwaving polycarbonate plastic.

ZOOLOGY CATEGORY (CONTINUED):

63. SPONGE REGENERATION RATES IN DIFFERENT TEMPERATURES

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

Sponges are an important part of almost any marine ecosystem, especially Barnegat Bay. They are able to filter out particles, keeping the water relatively clean. With global warming becoming an issue, it is possible that sponges will not be able to survive in warmer temperatures, or their growth rate may change. To determine whether or not sponges grow better in a warmer or cooler environment, an experiment was conducted using three different tanks. The tanks were closely monitored so the salinity and temperature did not change. Three similar sized sponge samples were placed in the tanks and measured twice a week. The sponges failed to grow, and instead changed in color, disproving the hypothesis that sponges are able to grow better in warmer water.

64. OBSERVING SHELL PREFERENCE PATTERNS IN THE CARIBBEAN HERMIT CRAB (*Coenobita clypeatus*)

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

Hermit crabs are animals famous for inhabiting used shells of other organisms instead of creating their own. The purpose of this experiment was to observe the shell-choosing behaviors of three crabs and determine whether or not there was a pattern to the shells they chose. To do this, new shells would periodically be placed in the tank with the crabs and whichever shell they chose would be recorded. At the end of the experiment, the data would be analyzed to see if any patterns existed. The experiment was a complete failure: none of the crabs changed shells over the course of one month, and one of them died.

65. TREATMENT OF A WHOLE TANK SYSTEM: COPPER AND SHRIMP

Lucy Kosty, Block 3 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Dave Werner and Dr. John Wnek

Ichthyophthirius multifiliis or “the Ich” is a parasitic disease that infects fish in saltwater and freshwater tank systems. Fish with this disease can easily be treated with medicated solutions, but for invertebrates living in the tank system, the use of these medications is known to be lethal. Therefore, copper treatment is often done with fish in isolation. Although the fish is treated, the disease can still be residual in the original system. This experiment was conducted to determine optimal copper levels to treat fish, with no mortality to invertebrates. By dissolving copper sulfate in a tank system of shore shrimp (*Palaemonetes vulgaris*), a maximum copper concentration was determined. Various recommended amounts of copper sulfate for medicating aquaria fish were conducted for one week as well as a lethal dose analysis. Exposure to lower levels of copper sulfate resulted in a 100% survival rate, but as the initial 2.5 milligrams of copper per liter of water was doubled to 5 milligrams, there was a 90% percent survival rate. My results suggest that shore shrimp did have a strong tolerance for the copper, at the 5 milligrams per liter concentration. With the tolerable amount of copper obtained, aquariums can treat their diseased fish more efficiently and with no harm to invertebrates.

ZOOLOGY CATEGORY (CONTINUED):

66. HORSE HAIR THICKNESS ACCORDING TO SEASONAL VARIATIONS

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

A horse's coat must adapt to the climate and the different seasons throughout the year. It is blatant that there is a significant difference between the lengths of the horse's hair from before and after the winter seasons. However, it is not as obvious when looking at the horse's hair that the thickness of the hair varies as well. The horse's hair does grow lengthwise in the winter, but does the thickness of the horse's hair differentiate throughout the seasons? You would think not when looking at the hair with your naked eye. When really looking at the hair under the microscope and comparing the samples from before winter and after winter, it can be seen that there is a difference in the thickness. In order to conclude this theory, a definite measure of the thickness must be determined by using a micrometer. A micrometer measures in micrometers, or 1,000,000 micrometers is equal to 1 meter. The micrometer successfully measured the thickness of the two samples of each of the six horses. The first samples of the six horses were taken before winter, and the second samples of the six horses were taken after winter. Once these definite measurements were recorded, the outcome of the experiment can finally be concluded based on the fact that the measurements vary greatly.

67. THE EFFECT OF TWO MARINE MACROALGAE ON THE QUALITY OF CHICKEN EGGS WHEN USED AS A DIETARY SUPPLEMENT

Gillian Schriever, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Dave Werner and Dr. John Wnek

The yolk of a chicken egg is affected by carotenoid pigments that the chicken obtains by eating. The more carotenoids a hen eats, the darker the yolk becomes. The egg industry usually obtains this darker color by supplementing the hen's feed with marigold leaves, artificial carotenoids, or corn, but what about marine macroalgae? Can the pigments found in algae from the phyla *Chlorophyta* and *Rhodophyta* help produce eggs that have a darker yolk than yolks from hens fed a diet that is not supplemented? To test this, thirteen hens were put in cages and fed a diet of either commercial feed enriched with *Ulva lactuca*, commercial feed enriched with *Agardhiella tenera*, or commercial feed without any supplements. The color of the egg yolks produced by the hens were analyzed by using the DSM Yolk Color Fan. The color score the yolk received and the diet of the hen that laid the egg was then graphed. For one group of hens, the data showed a statistically significant difference in yolk color when compared to the other diet types, which led to the conclusion that macroalgae can affect the yolk of the egg by making it darker in color.

68. TOADFISH AGGRESSION

Courtney Tierney, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Werner and Dr. Wnek

For the oyster toadfish (*Opsanus tau*), it could be a matter of survival for them to be aggressive because they stay in the same area all year long. It is only natural that they could be aggressive towards each other. From my research, I hypothesized that all the toadfish would become aggressive when there were three toadfish in one tank with only two rocks. By observing two toadfish in the tank for a week, and then adding a third toadfish to the tank for a week, I was able to observe the aggressive acts. This also allowed me to compare the aggression between two toadfish, and the aggression between three toadfish. I did this experiment three different times, separating a different fish each time. I did not foresee that the toadfish would also be somewhat aggressive when there were only two toadfish in one tank. My studies did support my hypothesis and suggest that with more fish, comes more aggression. In captivity, toadfish aggression needs to be monitored in systems if multiple toadfish are to be kept.

ZOOLOGY CATEGORY (CONTINUED):

69. BEHAVIOR OF SHRIMP UNDER DIFFERENT LIGHT

Zach Zega, Block 1 Science Class, Marine Academy of Technology and Environmental Science (MATES),
Advisors: Mr. Jason Kelsey and Dr. John Wnek

Shrimp are not thought of as a good animal to experiment with. We eat them at our summer barbeques and parties. Shrimp are often thought of as food, but they can be used to figure out how our ecosystem works. Global climate change may cause changes in weather patterns, which may cause changes in cloud cover around our area. If there are more clouds or changes in weather patterns, animals such as shrimp—which are vital to our ecosystem—may be exposed to different types of light. If this were the case, then it would be important to understand how shrimp react to different kinds of light. This experiment was aimed to answer what may happen to shrimp if they were exposed to different kinds of light. In the end, shrimp exposed to red light were the most active, and the shrimp in the control tank and the shrimp in the red light were the most successful in living. Shrimp in red light may have been the most active because red light is the least common light in a shrimp's environment.