Honors Science Program

Scientific Research Symposium

The Difference

Heathwood Hall Episcopal School

The Upper School Science Department of Heathwood Hall Episcopal School
invites parents, families, friends, and faculty
to join us in celebrating our Honors Science Students as Independent Scientists at the

Heathwood Hall Honors Scientific Research Symposium

To be held
Tuesday, April 13 thru Thursday, April 15, 2010
from 5:00 pm – 7:45 pm
in the
Susan Gibbes Robinson Center for Science & Mathematics

Each evening Honors Science students will be presenting their independent research projects in preparation for their presentations at the SC Junior Academy of Science Annual Meeting.

Light snacks and refreshments will be provided.

This document contains the schedule of events and research abstracts for all of the projects.
You can navigate this document as follow:

- **Click on a student name to go to that student's assigned presentation time**
- **Click on the title of the project to be taken to the abstract**
- **Click on the Abstract Title to be returned to the current evening's schedule**
- **Use the "Return Home" link to return to the alphabetic list of student presenters.**

- **Click on a student name to go to that student's assigned presentation time**
- **Click on the title of the project to be taken to the abstract**
- **Click on the Abstract Title to be returned to the current evening's schedule**
- **Use the "Click her to return to the Alphabetical list of Students".**

Tuesday, April 13th

: Click here to return to Alphabetical List of Students

Click on the title of the project to be taken to the abstract

(Welcome) 5:00-5:15 pm
(Session 1) 5:15-5:30 pm _____

(Session 2) 5:30-5:45 pm .....**Evie Cooke & Elizabeth Fonger** (9th)
DOES PRICE HAVE ANY EFFECT ON THE WEARABILITY OF LIPSTICKS?

(Session 3) 5:45-6:00 pm .....**Gabe Brandner & Charles Williamson (**9th)
THE EFFECT OF WOOD TYPE BAT ON THE EXIT VELOCITY AND SPEED ON THE BASEBAL

(Session 4) 6:00-6:15 pm.....**Derek Kaczmarski** (11th)
THE EFFECT OF INCREASING PRESSURE ON THE DIAMETER OF A BASEBALL.

(Session 5) 6:15-6:30 pm .....**Charlotte Jones & Charlotte Hanchard** (9th)
THE EFFECT OF CAFFEINE ON A PERSON'S HEART RATE AFTER EXERCISE

(Session 6) 6:30-6:45 pm .....**Ian Buckley & Thad Moore** (11th)
THE EFFECTS OF ELEVATION CHANGES ON CARBON DIOXIDE LEVELS IN A MOUNTAIN ENVIRONMENT AND THEIR COMPARISON TO GLOBAL CARBON DIOXIDE LEVELS

(Session 7) 6:45-7:00 pm .....**Ellis Sojourner** (11th)
ANALYSIS OF FILM AND COMPUTED RADIOGRAPHY DATA REPRODUCIBILITY WHEN PLOTTING A CHARACTERISTIC CURVE.

(Session 8) 7:00-7:15 pm .....**Ali Robertson & Margaret Mercer** (11th)
THE IDENTIFICATION OF A LIPSTICK BRAND: A COMPARISON OF THE RED PIGMENT RF VALUE USING THIN LAYER CHROMATOGRAPHY

(Session 9) 7:15-7:30 pm .....**Freddie Powers** (11th)
THE EFFECTIVENESS AT PREVENTING THE GROWTH OF Staphylococcus epidermidis BY TOPICAL TREATMENTS AS COMPARED TO COPPER

: Click here to return to Alphabetical List of Students

Click on the title of the project to be taken to the abstract

- **Click on a student name to go to that student's assigned presentation time**
- **Click on the title of the project to be taken to the abstract**
- **Click on the Abstract Title to be returned to the current evening's schedule**
- **Use the "Click her to return to the Alphabetical list of Students".**

Wednesday, April 14th

: Click here to return to Alphabetical List of Students

Click on the title of the project to be taken to the abstract

(Welcome) 5:00-5:15 pm

(Session 1) 5:15-5:30 pm .....**Olivia Harden & Pinkney Beal** (9th)
THE EFFECTS OF CALCIUM CHLORIDE CONCENTRATION ON THE TRANSFORMATION OF E. COLI BACTERIA COLONIES

(Session 2) 5:30-5:45 pm .....**Fripp Prioleau & Renae Gray** (10th)
THE EFFECT OF CHEMICALS LEACHED FROM POLYCARBONATE WATER BOTTLES WHEN EXPOSED TO ALTERED TEMPERATURE OF WATER ON THE MORTALITY OF DAPHNIA MAGNA

(Session 3) 5:45-6:00 pm .....**Maddie Norris & Helen Clay** (9th)
THE EFFECTS OF 0 MILLIGRAMS, 20 MILLIGRAMS, AND 80 MILLIGRAMS OF CAFFEINE ON REACTION TIME

(Session 4) 6:00-6:15 pm.....**Brook Grice & Elise McKelvey** (9th)
THE RELATIONSHIP BETWEEN THE PRICE OF SUNSCREEN AND ABSORPITON OF UVA AND UVB RAYS

(Session 5) 6:15-6:30 pm .....**Leigh Yarborough** (11th)
A DEEPER LOOK INTO THE MINERAL COMPOSITION OF SOUTH CAROLINA SPRING WATER: A STUDY OF THE RELATIONSHIP BETWEEN THE RATIO OF Ca:Mg IONS IN SOUTH CAROLINA SPRING WATER AND ITS UNDERLAIN LITHOLOGY

(Session 6) 6:30-6:45 pm .....**Chris Metzger & Jannie Adams** (10th)
THE EFFECT OF TEXT COLOR ON THE ABILITY TO RECALL

(Session 7) 6:45-7:00 pm .....**SJ Smith & Danielle Zurcher** (10th)
THE EFFECT OF WII™ TENNIS VS. REAL TENNIS ON HEART RATE AND BREATHING RATE

(Session 8) 7:00-7:15 pm .....**Will Norris & Andrew Wood** (10th)
THE EFFECT OF TEXTING AND DUI SIMULATION ON CRASH BEHAVIOR

(Session 9) 7:15-7:30 pm .....**Connor Kirol & Sanchit Kapur** (11th)
CAR ALLOWANCE REBATE SYSTEM: THE EFFECT OF ALUMINUM AND MAGNESIUM ON THE FORMATION OF A SODIUM SILICATE LAYER

(Session 10) 7:30-7:45 pm.....**Jack Lim & Sam Feldman** (11th)
THE EFFICACY OF CHLORINE, BROMINE, AND HYDROGEN PEROXIDE TREATED WATER AT PREVENTING THE GROWTH OF CHLORELLA PYRENOIDOSA

: Click here to return to Alphabetical List of Students

Click on the title of the project to be taken to the abstract

- **Click on a student name to go to that student's assigned presentation time**
- **Click on the title of the project to be taken to the abstract**
- **Click on the Abstract Title to be returned to the current evening's schedule**
- **Use the "Click her to return to the Alphabetical list of Students".**

Thursday, April 15th:

: Click here to return to Alphabetical List of Students

Click on the title of the project to be taken to the abstract

(Welcome) 5:00-5:15 pm

(Session 1) 5:15-5:30 pm .....**Amanda Hoefer & Mackenzie Sumwalt** (10th)
THE EFFECT OF FAT LEVELS IN YOGURT ON THE INHIBITION GROWTH OF E.COLI AS MEASURED BY ZONE OF INHIBITION

(Session 2) 5:30-5:45 pm .....**Thomas Davant** (10th)
THE EFFECTS OF CONVENTIONAL PESTICIDES, BIOPESTICIDES, AND BIOLOGICAL CONTROL ON DROSOPHILA MELANOGASTER

(Session 3) 5:45-6:00 pm .....**Rob Smith & Akida Lebby** (10th)
THE EFFECT OF TIME OF RELEASE OF A PERMETHRIN FOGGER ON THE DEATH RATE OF DROSOPHILA HYDEI

(Session 4) 6:00-6:15 pm.....**Connor Hoffman** (10th)
THE EFFECT OF CLEAR-POLYMER MAGNIFYING BARS ON THE EFFICIENCY OF A SOLAR PANEL

(Session 5) 6:15-6:30 pm .....**Madison Wactor & Angelica Blalock** (10th)
THE EFFECT OF FOOT TYPE ON WEIGHT DISTRIBUTION WHILE "EN POINTE"

(Session 6) 6:30-6:45 pm .....**Mary Grace Foster & Mimi Slade** (9th)
AN ANALYSIS OF THE HORIZONTAL VELOCITY AND VERTICAL ACCELERATION AT THE BOTTOM OF THE FIRST HILL OF THE AFTERBURN ROLLER COASTER USING MATHEMATICAL MODELING AND VIDEO ANALSIS METHODS

(Session 7) 6:45-7:00 pm .....**Christina Miller & Allison Jones** (9th)
DOES THE HEIGHT OF THE TEE AFFECT THE DISTANCE AND ANGLE OF THE GOLF BALL AS IT FLIES

(Session 8) 7:00-7:15 pm .....**Catherine Demmerle & Grace Smith** (9th)
THE EFFECT OF SERRATIA MARCESCENS ON DIFFERENT TYPES OF WATER

(Session 9) 7:15-7:30 pm ....._____

: Click here to return to Alphabetical List of Students

- **Click on a student name to go to that student's assigned presentation time**
- **Click on the title of the project to be taken to the abstract**
- **Click on the Abstract Title to be returned to the current evening's schedule**
- **Use the "Click her to return to the Alphabetical list of Students".**

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

THE EFFECT OF FOOT TYPE ON WEIGHT DISTRIBUTION WHILE "EN POINTE"

Angelica Blalock
Madison Wactor
Heathwood Hall Episcopal School

The pointe shoe, a satin slipper reinforced with stiff canvas, leather, and wood, is an essential tool for accomplished female ballet dancers as it allows them to balance on the tips of their toes creating an illusion of weightlessness. However pointe shoes cause discomfort and even injuries, some of which are provoked by the dancer's foot type. There are three main types of feet- Egyptian, Greek, and Square- based on the length of toes in comparison to one another. Differences in toe length affect how weight is distributed over the box of a pointe shoe- when different toes bear more weight, problems can occur in the foot. The purpose of this experiment was to test how different foot types distribute weight while en pointe. Pressurex film was used to determine the pressure on different areas of the Egyptian, Greek and Square foot types in traditional shoes. It was found that while the toe with the greatest length did bear a little extra weight in comparison to the toes with less length, most weight was distributed on the outside edges of the box. This partially supported the hypothesis that longer toes would bear the most weight in pointe shoes. The toes of greatest length did bear more weight than the other toes, but this did not support our hypothesis in that the outer rim of the shoe supported more weight than any of the toes, regardless of length.

THE EFFECT OF WOOD TYPE BAT ON THE EXIT VELOCITY AND SPEED ON THE BASEBALL

Gabe Brandner
Charles Williamson
Heathwood Hall Episcopal School

There are a lot of choices when it comes to choosing the right baseball bat. There is maple and ash, the two main and most popular wood types of choice, but there a new wood making an appearance in the major leagues, bamboo. 2008 NL Batting Champion, Chipper Jones, has given bamboo a good reputation. This experiment compared ash, maple, and bamboo bats in two categories: exit velocity of the ball off the bat and distance the ball traveled. Hypothesis 1: the use of an ash bat will result in the greatest speed and distance as compared to the maple and bamboo bats. Hypothesis 2: the use of a bamboo bat will result in the greatest speed and distance as compared to the ash and maple bats. Hypothesis 3: the use of a maple bat will result in the greatest speed and distance as compared to the ash and maple bats. The results supported hypothesis 2. The independent variables in this experiment were the ash, maple, and bamboo bats. The dependent variable was the exit velocity and distance of the ball. Former MLB player, Coach Ashley Farr, performed the test. He was chosen because of his ability to duplicate his swing, making the results as consistent as possible. The bamboo bat performed greatest in the distance category. The ash bat performed best in the exit velocity category, but bamboo was closely behind. Overall, the bamboo bat performed the greatest.

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

DOES PRICE HAVE ANY EFFECT ON THE WEARABILITY OF LIPSTICKS?

Evie Cooke
Elizabeth Fonger
Heathwood Hall Episcopal School

The purpose of this experiment was to compare three differently priced lipsticks (inexpensive, moderate, expensive) to determine which lipstick had greater wearability. Is cost of a lipstick related to the how well is wears? Each lipstick was tested 8 times, 4 trials for 2 different experiments. Measurements of how much lipstick rubbed off after experimental treatment of both side-to-side motion and pressure on lipstick blots. These tests were designed to simulate rubbing lips back and forth, and blotting the lipstick. A wooden device was built to test these factors as an indication of wearability. The independent variable of the project was friction and pressure, while the dependent variable was the grams of lipstick rubbed off. From data collected, it was determined that the least expensive lipstick had the least amount of mass rubbed off after the tests and implied the greatest wearability. These results do not support the hypothesis, which was that if three brands of lipsticks were tested; the most expensive lipstick would have the greatest wearability. The data analysis failed to reject the null hypothesis, that there is no difference in wearability among different brands of lipstick, and that cost played no role in wearability.

THE EFFECTS OF CONVENTIONAL PESTICIDES, BIOPESTICIDES, AND BIOLOGICAL CONTROL ON DROSOPHILA MELANOGASTER

Thomas S. Davant VII
HEATHWOOD HALL EPISCOPAL SCHOOL

This study investigated the effects of conventional pesticides, biopesticides, and biological control on the mortality rate of Drosophila melanogaster. This study may enlighten people about using safer alternatives to harmful pesticides. Twelve Drosophila climbing ladders were placed in individual jars with ten Drosophila for each jar. Three climbing ladders were sprayed for three seconds on both sides with Raid® Flying Insect Killer: Formula 5 and three were sprayed with EcoPCO® ACU Contact Insecticide. A long-tailed lizard was put in each of the three jars for biological control. For the control, ten Drosophila were put into three jars, each with a climbing ladder. Mortality rate was recorded for the first three hours and at the twenty-four hour mark. Mean data and standard deviation were determined, and an ANOVA test showed no statistically significant difference between the conventional pesticide and biopesticide. There was no statistically significant difference between the conventional pesticide and the biological control, showing that the biological control works just as well as the conventional pesticide. Also, there was a statistically significant difference between the conventional pesticide and the control, and there was a statistically significant between the biopesticide and the control.

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

AN ANALYSIS OF THE HORIZONTAL VELOCITY AND VERTICAL ACCELERATION AT THE BOTTOM OF THE FIRST HILL OF THE AFTERBURN ROLLER COASTER USING MATHEMATICAL MODELING AND VIDEO ANALSIS METHODS

Mary Grace Foster
Mimi Slade
Heathwood Hall Episcopal School

In this experiment, the horizontal velocity and vertical acceleration of the Afterburn coaster were investigated. The horizontal velocity was measured with a physics mathematical equation and video analysis. The vertical acceleration was also measured with a video analysis and direct measurements using a spring accelerometer. The hypothesis was that a mathematical prediction would accurately predict the horizontal velocity of the actual coaster, "Afterburn." The other part of the hypothesis was that the vertical acceleration found by the spring accelerometer would correspond with the vertical acceleration found by the video analysis. The null hypotheses were that the mathematical prediction would not accurately predict the horizontal velocity of the actual coaster, "Afterburn", and the vertical acceleration found by spring accelerometer will not correspond with the vertical acceleration found by the video analysis. An ANOVA test was run to compare the mean accelerations obtained graphically to the mean acceleration measured with the spring accelerometer. The results of the ANOVA indicated the "Fstat" (101.29) is outside the range of the "Fcrit" (+/- 4.19). Therefore, there is a statistically significant difference between the mean acceleration obtained graphically and the mean of acceleration measured with the spring accelerometer. This can be said with a 95% confidence. The average velocity found using video analysis was 37.967 m/s. The velocity found using the mathematical formula was 46.430 m/s. The two velocities found showed that there is about a 19.94% difference. Those results support both of the null hypotheses and reject the both of the hypotheses.

THE RELATIONSHIP BETWEEN THE PRICE OF SUNSCREEN AND ABSORPITON OF UVA AND UVB RAYS

Brooke Grice
Elise McKelvey
Heathwood Hall Episcopal School

For this project, three different types of SPF 30 sunscreen were used. The prices of these sunscreens ranged from $0.83 per ounce to $3.33 per ounce. Walgreens brand, Banana Boat Sport Performance, and Aveeno are the three sunscreens that were tested. For this experiment, the independent variable was the brand (cost) of sunscreen, and the dependant variable was the amount of UVA and UVB absorbed. An ANOVA (Analysis of Variance) test was taken, and since the F value was smaller than the F critical, there wasn't any specific difference. These results support our null hypothesis, that the expense of the sunscreen will not affect its absorption of UVA and UVB rays. The data rejected our hypothesis, that the more expensive brands of sunscreen will absorb more UVA and UVB rays that the less expensive brands.

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

THE EFFECT OF CAFFEINE ON A PERSON'S HEART RATE AFTER EXERCISE

Charlotte Hanchard
Charlotte Jones
Heathwood Hall Episcopal School

For the experiment different energy sources and a controlled variable were tested to see which one would have the most effect on a subject's heart rate after exercise. The point of this experiment was to give athletes information about energy drinks that will help them exercise or give them information about how their heart rate will react the caffeine supplement. In this experiment the dependent variable, a person's heart rate, will be affected by the independent variable, the caffeine supplement (5-Hour Energy, Gatorade, and St. John's Wort). The hypothesis for the experiment was that the 5-Hour Energy drink would have the greatest affect on the heart rate. The result supported the null hypothesis, no difference in the heart rate after consumption of the energy supplements. The methods of the experiment were: to drink the energy supplement, test the heart rate five minutes after, then performing 20 jumping jacks, 10 push up, and 10 sit ups, and finally test the end heart rate after exercise. The overall finding of the data was that all the supplements basically have the same impact on the heart rate after exercise. The significance of this is that the 5-Hour Energy might be as good of a product as Gatorade or St. John's wort.

THE EFFECTS OF CALCIUM CHLORIDE CONCENTRATION ON THE TRANSFORMATION OF E. COLI BACTERIA COLONIES

Olivia C. Harden
Pinkney V. Beal
Heathwood Hall Episcopal School

The title of this experiment was Bacteria Transformation: Does the concentration of calcium chloride effect the transformation of E. coli bacteria? When researching experiment subjects, it was found that scientists believe that to transform E. coli bacteria and successfully insert the gene for Green Fluorescent Protein (GFP) into it, genome exposure to calcium chloride is critical. The hypothesis was that to higher concentrations of exposure to calcium chloride during transformation would increase the number of E. coli bacteria that successfully received the pGLO gene. This experiment determined how the concentration of calcium chloride could affect the amount of E. coli bacteria that accepted the pGLO gene. Basically, in this experiment, ager, ampicillin, and arabinose were mixed, poured into 40 Petri dishes and then left to cool. After the solutions cooled, CaCl2 of different concentrations (12.5%, 25%, 50%, 75%, 100%) and the E. coli were spread in each Petri dish. When the dishes were done incubating, a black light was used to see if the colonies had accepted the pGLO gene. The independent variable in this experiment was the concentration of the CaCl2 CaCl2 and the dependent variable is the amount of fluorescent colonies in the Petri dishes of each concentration. The results showed that as the concentration increased, the amount of glowing colonies increased also.

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

THE EFFECT OF CLEAR-POLYMER MAGNIFYING BARS ON THE EFFICIENCY OF A SOLAR PANEL

Connor Hoffman
Heathwood Hall Episcopal School

The need for an alternative energy source is greater than ever before. The use of solar cells provides one solution provided they can be made to function at their full potential. The purpose of this experiment was to increase the efficiency of a solar panel by altering its mechanical construction. The change that was made to the solar panel was the addition of clear-polymer magnifying bars placed on the sides of the soar cell perpendicular to the movement of the sun. The hypothesis being tested was if clear-polymer magnifying bars are placed bordering the sides of a solar cell perpendicular to the movement of the sun, then that solar cell will have an increased energy output. First, the wattage output of the cell was measured with and without the magnifying bars while the cell was facing 0o, 30o, 60o, and 90o away from direct sunlight. The experiment was conducted 4 times and means and standard deviations were obtained for each group. There was an increase in efficiency when the bars were added of up to 4% when the panel was facing 60 degrees away from direct sunlight. The data were then analyzed using a single-factor ANOVA test. The data for the 0, 30, and 90 degree trials was not consistent enough to be statistically significant. This data still supported the hypothesis, however, since the cell did have an increase in efficiency with the addition of the magnifying bars when the panel was angled at 60 degrees.

DOES THE HEIGHT OF THE TEE AFFECT THE DISTANCE AND ANGLE OF THE GOLF BALL AS IT FLIES

Allison C. Jones
Christina L. Miller
Heathwood Hall Episcopal School

Most golfers realize that changing your tee height will affect the flight of the golf ball. In this study, the relationship between the tee height and the angle and distance of the golf ball in flight was studied. There were two hypotheses: a) that the shorter the tee, the longer the distance will be b) the higher the tee, the greater the angle will be. The null hypothesis was that tee height would have no affect on either distance or angle. To test this, we used three different tee heights. Test one was 1 inch, test 2 was 1.5 inches, and test 3 was 2 inches. The results of this study support one of our hypotheses, and do not support the other one. Our data shows that the higher the tee height, the greater the angle and the distance. The ANOVA test showed that there was a great difference between the angles of the first tee height and the third tee height. The ANOVA test also showed that there was a great difference between the distances of the first tee height and the third tee height.

THE EFFECT OF INCREASING PRESSURE ON THE DIAMETER OF A BASEBALL.

Derek Kaczmarski

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

CAR ALLOWANCE REBATE SYSTEM: THE EFFECT OF ALUMINUM AND MAGNESIUM ON THE FORMATION OF A SODIUM SILICATE LAYER

Sanchit Kapur
Connor N. Kirol
Heathwood Hall Episcopal School

The purpose of this study was to determine whether metal, aluminum or magnesium, was the most effective in rendering the engine unusable of a car in the Car Allowance Rebate System. It is hypothesized that the mass of the layer of sodium silicate produced from a reaction with forty percent sodium silicate solution will be greater on aluminum than magnesium in a ten second reaction, a twenty second reaction, and a thirty second reaction. Samples of aluminum and magnesium were placed into approximately 30mL of 38-42% Sodium Silicate solution that was heated to 75.5° C. After time intervals of 10, 20, and 30 seconds, the metal was removed from the solution and weighed on an analytical balance. The data analysis showed that the experimental design was effective in determining the difference of the reaction results between aluminum and magnesium at different times because the majority of the data yielded significant results. The data trends, including the mass after the reaction and the percent change between the two masses, show that aluminum was more effective in rendering the engine unusable in the Car Allowance Rebate System than magnesium. The results supported the hypothesis that the mass of the layer of sodium silicate produced from a reaction with forty percent sodium silicate solution was greater on aluminum than magnesium in a ten second reaction, a twenty second reaction, and a thirty second reaction. This project could be improved by testing a car used in the Car Allowance Rebate System.

THE EFFECT OF TIME OF RELEASE OF A PERMETHRIN FOGGER ON THE DEATH RATE OF DROSOPHILA HYDEI

Akida A. Lebby,
Roberts L. Smith
Heathwood Hall Episcopal School

By using complete release foggers to eradicate household pests, unintentional harm can come to other animals. Is it worth the risk, using these pesticides to kill pest, when pets might be killed in the process? Such was the main purpose of this experiment. It was hypothesized that if Drosophila hydei were exposed to food with permethrin within three hours of the fogger's release, then the specimens would have died within 24 hours. Carpet squares that were exposed to these foggers were used to transfer permethrin to water and then to the food of Drosophila hydei. Ten Drosophila hydei were placed into each container, and death rates of the Drosophila hydei were measured according to the time in which the Drosophila hydei died after every fifteen minutes starting at 45 minutes after the release of the fogger. The control group used the same procedures but without using a bug bomb, and for one control trial set, without using carpet. The results showed that the time that the permethrin was exposed to the air had no statistically significant effect on the death rate of the Drosophila hydei. The presence of the permethrin, however, brought about a 100% death rate in every trial set. The two control sets without permethrin had no deaths after 24 hours, and after around a week they even showed reproduction. These results further validate this experiment.

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

THE EFFICACY OF CHLORINE, BROMINE, AND HYDROGEN PEROXIDE TREATED WATER AT PREVENTING THE GROWTH OF CHLORELLA PYRENOIDOSA

Ji-Hyun J. Lim
Samuel R. Feldman
Heathwood Hall Episcopal School

The purpose of this experiment was to test the ability of chlorine, bromine or hydrogen peroxide pool chemicals at reducing the growth of Chlorella pyrenoidosa. To simulate a pool atmosphere, normal chemical level amounts for each chemical were added in proportion to tap water. For each of the pool chemicals and for untreated water, seven cuvettes were set up to simulate pool environments. Each cuvette was inoculated with a constant quantity of C. pyrenoidosa. To measure the growth of the C. pyrenoidosa, a Vernier© colorimeter (525 nm) was used to measure the light transmittance through each cuvette. On twelve consecutive dates, the transmittance for each cuvette was measured. Based on the chemical effect of H2O2 on cellular membranes, it was hypothesized that the percent growth of C. pyrenoidosa would be less with hydrogen peroxide treatment of water as compared to bromine and chlorine treatment. It was found that the C. pyrenoidosa had positive growth with each chemical over the twelve-day period. It was found that the C. pyrenoidosa had the greatest growth in cuvettes with the hydrogen peroxide treated water, while bromine and chlorine treated water had a lesser percentage growth as compared to water. The analyses of the data showed there were no statistical differences in the percent growth of the C. pyrenoidosa in the hydrogen peroxide treated cuvettes, chlorine treated cuvettes, and bromine treated cuvettes as compared to the untreated cuvettes.

THE EFFECT OF TEXT COLOR ON THE ABILITY TO RECALL

Christopher Metzger
Jannie Adams
Heathwood Hall Episcopal School

As a person is driving, only two to three seconds are available to look up and read a sign. The purpose is to test whether two colors' relative positions (complementary or adjacent) on a standard color wheel would affect a person's ability to recall the text after reading for two seconds. The test subjects were given five random words, each of five letters or fewer, on a computer screen. They were asked to read these words and then recount all of the words they remembered. There were four slides presented of each of these four color combinations: black and white (control), red and green (complementary), red and orange (adjacent), and red and indigo (adjacent). The number of words each subject got correct and the number in the correct order were recorded out of five, and then averaged for each of the color combinations. It was hypothesized that color combinations that are complementary would be easier to read than those which are adjacent on the color wheel, and the results supported this hypothesis. The control had the highest accuracy, and the orange text with the red background had the lowest accuracy. Each of the color combinations was then compared to the control group using an ANOVA test; the results showed that all the color combination had a statistically significant difference when compared to the control except the results from the red and indigo slides which was proven to be too similar to the results of the control slides to be significant.

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

THE EFFECTS OF ELEVATION CHANGES ON CARBON DIOXIDE LEVELS IN A MOUNTAIN ENVIRONMENT AND THEIR COMPARISON TO GLOBAL CARBON DIOXIDE LEVELS

Thaddeus Stephan Willhoit Moore
Ian Howell Buckley
Heathwood Hall Episcopal School

The purpose of this research was to measure carbon dioxide (CO2) concentrations on Roan Mountain at incremental elevations and to compare these data to the average global atmospheric concentration of CO2 in 2009 of 387.35 parts per million (ppm). It was hypothesized that as elevation increased at 152.4 m (500 ft) intervals, concentrations of CO2 would decrease, and when compared to the global average, the mountain environment would have a lower level of CO2. Because mountain environments are home to unique species, such as Roan Mountain's rhododendron garden—the largest in the world, that exist in harsh conditions, organisms residing on mountains are highly susceptible to minute changes in their environments. In the last two centuries an increase in the levels of atmospheric CO2 was observed, increasing from 275 ppm throughout most of human history to 2009's average concentration of 387.35 ppm. This change, occurring over a short time frame, has made observing, measuring and reporting concentrations of CO2, especially in sensitive settings, all the more important and significant. As elevation increased, concentrations of CO2 decreased significantly. The data collected were also compared to the 2009 average global concentration of CO2. Data collected at higher elevations (1468, 1620 and 1772 m) showed CO2 concentrations significantly lower than global averages. Data at lower elevations (1315 and 1162 m) showed differences that were statistically insignificant when compared to global data. These results suggest that the air on Roan Mountain, compared to global averages, is within an acceptable range of CO2 concentration.

THE EFFECTS OF 0 MILLIGRAMS, 20 MILLIGRAMS, AND 80 MILLIGRAMS OF CAFFEINE ON REACTION TIME

Maddie S. Norris
Helen B. Clay
Heathwood Hall Episcopal School

This study compared the effects of 0 milligrams, 20 milligrams, and 80 milligrams of caffeine on the reaction time of teenage girls. The hypothesis was that the 80 milligrams of ingested caffeine would statistically decrease the reaction time more than the 20 milligrams of caffeine. The independent variable was the caffeine amount and the caffeine source, while the dependent variable was the mean reaction time. Ten girls of the ages fourteen through fifteen took the reaction test (Biobytes) on a computer with no caffeine in their system. Afterwards, they digested 2 oz of Red Bull, which contained 80 mg of caffeine, waited 20 minutes for it to be fully absorbed into their system, and then took the reaction test again. This process was then repeated a week later using 2 oz of Folgers Coffee, which contained 20 mg of caffeine. The data showed that when using a one-tail t-test, the reaction times significantly quickened between 0 mg of caffeine and 80 mg of caffeine. The results thus supported the alternate hypothesis, that the reaction time significantly decreases between when 0 mg of caffeine are consumed and 80 mg of caffeine are consumed. Therefore, digesting 80 mg of caffeine significantly decreases your reaction time, thereby effectively improving response time.

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

THE EFFECTIVENESS AT PREVENTING THE GROWTH OF STAPHYLOCOCCUS EPIDERMIDIS BY TOPICAL TREATMENTS AS COMPARED TO COPPER

Frederic S. Powers
Heathwood Hall Episcopal School

The purpose of this experiment was to compare the zones of inhibition created by bleach, isopropyl alcohol, and gluteraldehyde to the zone of inhibition created by copper. The hypothesis stated that copper would have the largest zone of inhibition. To add the Staphylococcus epidermidis to pre-poured agar plates, two inoculating loops of bacteria were added to a tube of nutrient broth, and 200 microliters of nutrient broth were added to each dish. Four dishes had a disc of copper placed in the middle; four had a normal disc of filter paper in the middle, and the other twelve had a disc of filter paper soaked in bleach, isopropyl alcohol, or gluteraldehyde placed in the middle. All dishes were incubated at 350C. Analysis of measurements showed that isopropyl alcohol, bleach, and gluteraldehyde each created larger zones of inhibition than that of copper. Gluteraldehyde had the largest average zone of inhibition, then bleach, then isopropyl alcohol. The data were averaged and the zones of inhibition from bleach, isopropyl alcohol, and gluteraldehyde were compared to the zones of inhibition made by copper using a t-test. The results were analyzed by a one-way ANOVA test (alpha=0.05). The results showed that the differences were significant and failed to reject the null ***hypothesis. The hypothesis that copper creates a greater zone of inhibition was not supported.***

THE EFFECT OF CHEMICALS LEACHED FROM POLYCARBONATE WATER BOTTLES WHEN EXPOSED TO ALTERED TEMPERATURE OF WATER ON THE MORTALITY OF DAPHNIA MAGNA

Fripp Prioleau
Renae Gray
Heathwood Hall Episcopal School

Bisphenol A (BPA), a high-production-volume chemical, is used in the manufacturing of polycarbonate plastic. Low-level concentrations of BPA in animals suggests that BPA causes endocrine disruption and possibly death. The correlation between the leaching of the potentially dangerous chemical from polycarbonate containers and toxicity was examined in this experiment through toxicology tests using Daphnia magna. It was hypothesized that, if the contents of polycarbonate containers were boiled (100 oC) or frozen (0 oC), then they would be more toxic as compared to the control group, and the boiling group would be most toxic. Water was exposed to varying temperatures and contained in 9 polycarbonate water bottles until returned to room temperature. Three bottles contained boiling water, three were frozen, and three were left at room temperature. Water from each bottle was removed and added to 3 individual Petri dishes. 10 Daphnia magna were added to each plate and the number alive after each hour was recorded. The boiling and freezing groups showed higher mortality among Daphnia than the control groups, and the boiling groups had the highest mortality rate.
Using one-way ANOVA, the boiling and freezing groups yielded statistically significant results ($p<0.05$) when compared to the control group, with p-values of 0.00020 and 0.00002 respectively. However, the boiling and freezing groups were not statistically significant ($p>0.05$), with a p-value of 0.66483. These results indicate that the previous studies were correct in stating that Bisphenol A leaches at varied temperatures and contains toxic qualities; therefore, the proposed hypothesis was accepted.

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

THE IDENTIFICATION OF A LIPSTICK BRAND: A COMPARISON OF THE RED PIGMENT R_F VALUE USING THIN LAYER CHROMATOGRAPHY

Ali B. Robertson
Margaret J. Mercer
Heathwood Hall Episcopal School

Forensic evidence can be left behind at a crime scene in many different ways. Lipstick, when analyzed correctly, can be a valuable addition to any selection of forensic evidence. Essentially, all lipsticks are composed of wax, oil, alcohol, and pigments. Thin layer chromatography (TLC) is one method that can be used to identify a lipstick by displaying the band pattern of its dyes. In TLC, the dyes and pigments in the samples of lipstick will travel with the solvent up the chromatography paper and separate according to their solubility within the solvent. It was hypothesized that three lipsticks could be identified by their red pigments alone- that they would have a pigment with an Rf value unique to their brand. A solvent was prepared from acetone, ammonium hydroxide, distilled water, and isoamyl alcohol. Four chromatograms were completed and Rf values for each lipstick's banding patterns were calculated. The data was analyzed using an Analysis of Variance (ANOVA) single factor test, and the differences between each lipstick's Rf values for the red pigment were found to be statistically insignificant. Thus, the hypotheses were rejected, and the null hypotheses were accepted. It was further noted that a qualitative identification of the lipsticks was possible through the presence of bands that were unique to their chromatogram.

THE EFFECT OF SERRATIA MARCESCENS ON DIFFERENT TYPES OF WATER

Grace H. Smith
Catherine Demmerle
Heathwood Hall Episcopal School

When drinking water is exposed to air, the water is open for bacteria in the air to get into the water, allowing it to grow and spread. Serratia marcescens was chosen as the bacteria because it is found in the sub gingival bio film of the teeth. The serratia marcescens was died pink so that it could be detected. The four different types of water were well water, tap water, spring water, and distilled water. Two different methods were used to collect the data. When the suspension and spreading technique was used, there were nine different results per water. When the streaking technique was used, there were five results per water. The hypothesis was that the well water would support the most growth. The hypothesis was rejected and the null hypothesis, that there was no difference in the four waters, was accepted.

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

THE EFFECT OF WII™ TENNIS VS. REAL TENNIS ON HEART RATE AND BREATHING RATE

Sarah Jackson Smith
Danielle Zurcher
Heathwood Hall Episcopal School

In this experiment, the effect of heart rate and breathing rate on Wii™ tennis and normal tennis was examined. It was hypothesized that playing real tennis will create a larger increase in heart rate and breathing rate than playing Wii™ tennis. Findings of this study could be beneficial by showing that even though active video games may be better for your health then sedentary video games, they are no substitute for playing traditional sports. This experiment was performed by first testing the resting heart rate and breathing rate of ten participants. The students were then asked to play Wii™ tennis for fifteen minutes and their heart rate and breathing rate were recorded again. Then the same methods were repeated for real tennis using a ball machine set at a speed of 40 MPH with an average spin and balls shot at an interval of three seconds. The change in heart rate and breathing rate for each participant were determined. The mean and standard deviation were determined for the change in heart rate and breathing rate for all participants. There was a statistically significant change in heart rate but not in breathing rate, as shown by the ANOVA analysis. The collected data at the end of this experiment ssuggestd that real tennis raised the heart rate of participants significantly more than Wii™ tennis. Most of the participants reached the target exercising heart rate for their age group, while none of the participants reached their target heart rate by playing Wii™ tennis. These results allowed for the hypothesis to be accepted and suggested that playing Wii™ tennis is not a good substitute for playing traditional tennis.

ANALYSIS OF FILM AND COMPUTED RADIOGRAPHY DATA REPRODUCIBILITY WHEN PLOTTING A CHARACTERISTIC CURVE.

Ellis M. Sojourner
Heathwood Hall Episcopal School

Radiographs, 2D pictures to view the inside of objects, are produced from the capture of X-rays absorbed by a detector, either film or digital. The purpose of this experiment was to compare reproducibility results of computed radiography to film radiography. Radiographs were processed at 80 kilovolts peak (kVp) and milliamp per second (mAs) values 10, 20, 40, 90, 120, 150, 180, 240, 300, and 450, using film radiography. This process was repeated twice on two different days, with the same type film from the same box, the same subject, the same area of the radiograph tested, and same type of radiation. The optical density of the same point on each radiograph was measured using a densitometer. This process was repeated using computed radiography equipment, technology, and procedure. This sample size included mAs values 125, 160, 200, 250, 320, 500, 640, and 960 and identical radiograph positions using AGFA software to measure the Scan Average Level. The calculated t-stat value was 3.127, not falling in the reject region of the t-Critical two-tail value ±2.080 (α= 0.05). It was concluded from this experiment that the data resulting from film radiography had a much larger average slope deviation (9.18%) than computed radiography (0.60%). Because the average slope deviation for film radiography was significantly larger, the null hypothesis, that no difference would exist in data reproducibility when illustrating a characteristic curve, was rejected. The experimental hypothesis was accepted that data results from the computed radiography method are more reproducible than results from film radiography.

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

THE EFFECT OF FAT LEVELS IN YOGURT ON THE INHIBITION GROWTH OF E.COLI AS MEASURED BY ZONE OF INHIBITION

Kaylyn M. Sumwalt
Amanda T. Hoefer
Heathwood Hall Episcopal School

Many Americans suffer from a variety of digestive ailments. Probiotics, a culture often found in yogurt, have been found, through a variety of studies, to be an effective treatment for a variety of ailments which range from digestive tract health to atopic ezcema in infants. Based on the supposition that probiotics are beneficial to health, the purpose of this experiment was to determine if a raised fat content of a yogurt could augment the size of zone of inhibition when in a plate of E. Coli. The hypothesis was that if a yogurt has a raised fat content, then it will create a greater zone of inhibition when compared to the zones of inhibition created by solutions made from lowered-fat yogurts. The null hypothesis was if yogurt has a raised fat content, then it will not cause a zone of inhibition different than lowered-fat yogurt solutions. An experiment was conducted by inoculating plates with E. coli, placing discs soaked in respective types of yogurt (2.5g, 1.5g, and 0g) into the plates, and measuring the zones of inhibition at 24, 48, and 72 hours. The null hypothesis was rejected and the hypothesis accepted, as the yogurt with 2.5 grams of fat was found to be the most effective at inhibiting the growth of E. coli by ANOVA statistical analysis. This research could be extended into the study of the effect of fat levels of yogurt in inhibiting bacterial growth when compared to common antibiotic agents.

THE EFFECT OF TEXTING AND DUI SIMULATION ON CRASH BEHAVIOR

Andrew O. Wood
William S. Norris
Heathwood Hall Episcopal School

The purpose of this experiment was to compare texting while driving and simulated drunk driving to test which causes a driver to exhibit more crash behavior. The hypothesis is that when novice drivers are compared texting while driving and driving while wearing beer goggles in a simulator, the practice of texting while driving will cause the greatest amount of crash behavior when compared to driving without impairments. The 12 participants each completed three ten-minute periods in a driving simulator: one under normal driving conditions, one while texting, and one while wearing beer goggles that simulated having a blood alcohol concentration (BAC) of .10 to .17. These results were gathered and a total of 400 errors were made. Eighty-four of these errors were made within the control group, 191 errors were made while texting, and 125 errors were made while wearing Beer goggles. These errors ranged from a rolling stop at a stop sign to a 45 mile per hour wreck. The mean number of errors made while in the control group was 7 per driver. The mean number of errors while texting was 15.9, while the mean number of errors for beer goggles was 10.4. Based on a one-way ANOVA, there was a significant statistical difference between texting while driving versus beer goggles and versus the control. However, there was not a statistical difference between the drunk simulation and the control. From these results, the hypothesis that texting while driving would show the most crash behavior was supported.

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule

A DEEPER LOOK INTO THE MINERAL COMPOSITION OF SOUTH CAROLINA SPRING WATER: A STUDY OF THE RELATIONSHIP BETWEEN THE RATIO OF Ca:Mg IONS IN SOUTH CAROLINA SPRING WATER AND ITS UNDERLAIN LITHOLOGY

Leigh Yarborough

Heathwood Hall Episcopal School

In this experiment, the mineral composition of South Carolina spring water was examined. This could be beneficial knowledge of whether the mineral content of spring water is directly related to rocks underlain beneath them or is independent of the rocks and due to interactions of other aspects. It was hypothesized that spring water throughout the state would have an equal ratio of calcium and magnesium ions as the ratio of these ions in sterile water exposed to the rock embedded beneath the spring. Water from 6 springs throughout the state of South Carolina was tested for calcium and magnesium levels using direct titration. A spatial data mapping program was used to identify the type of rock(s) beneath sites. Sterile water was exposed to a sample of the rock from each spring at high temperatures for long periods of time. This water was also tested for calcium and magnesium levels in the same manner. Findings suggested that spring water of igneous and metamorphic regions had close ratio relations to water exposed to rock samples, thus suggesting a linear relationship of mineral composition between rock and water. Spring water of sedimentary regions had differing ratio relations to water exposed to rock samples, suggesting a non-linear relationship of mineral composition between rock and water. The results were analyzed using a one-way ANOVA statistical analysis test (α=0.05). Analyzed results revealed that ratios of spring water and igneous and metamorphic rock were significantly equal and ratios of spring water and sedimentary rock were significantly different.

: Click here to return to Alphabetical List of Students

Click on the abstract title to go back to the current evening's schedule