Honors Science Program

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

Honors Scientific Research Symposium

2017

Wednesday, March 22nd, 2017 from 4:30 p.m. – 8:00 p.m.
Wednesday, March 23, 2016 from 5:00 pm – 8:00 pm

Susan Gibbes Robinson
Center for Science & Mathematics

Keynote Speaker 4:30 pm Wednesday 3/22/17
Christian Graves
Director & Co-Founder of the Carolina Biotech Group (CBG).

Science and the Third Wave
We stand at a unique vantage point in history where technology is fundamentally changing the way science is conducted. The Third Wave, a term coined by Steve Case, refers to the convergence of science, technology, and connectivity. In his Keynote, Christian Graves, Co-Founder and President of the Carolina Biotech Group, will discuss how big data, connectivity, technology, and science are driving progress and impacting our world.

Please join us as the Honors Science students present 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.

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<td>Kate Nassab</td>
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Olivia Antonetti, Olivia Merritt, & Kit Mullins

Microbiology

WHAT IS THE RELATION BETWEEN SCHOOL DIVISION AND THE AMOUNT OF BACTERIA IN EVERYDAY PLACES

The purpose of this project was to find the relationship between school divisions and the amount of bacteria in everyday places. The tested locations were 1) water fountain buttons, 2) doorknobs, 3) computer keyboards, 4) desks, and 5) bathroom sink faucets. In order to find the amount of bacteria in each place, a cotton swab was swabbed on each location. The contaminated cotton swab was then placed on the petri dish using aseptic technique. Each petri dish already contained agar, that had been made and poured twenty-four hours beforehand. The hypothesis for this study states that if the amount of bacteria is compared between school divisions, then there will be a relationship between the amount of bacteria and school divisions. If there is a relation between school divisions and the amount of bacteria, then the lower school division will contain the most bacteria. The null hypothesis states that there will be no relationship between school divisions and the amount of bacteria. This experiment will benefit other schools because they will learn which division needs to be cleaned with more attention. Surprisingly, our results did not support our hypothesis, because the middle school showed the greatest amount of bacteria, when it was hypothesized the lower school would.

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Madeline Ashcraft

Environmental Science

THE EFFECT OF THE LOVES TRUCK STOP ON THE TEMPERATURE, PH, MERCURY, DISSOLVED OXYGEN, AND TURBIDITY ON THE NEARBY WETLANDS

The purpose of this project is to determine the effect, if any, a new Loves Truck Stop has on the wetlands near the campus of Heathwood Hall. The temperature, pH, mercury levels, dissolved oxygen, and turbidity of the water was tested before the truck stop opened, as well as after it opened. Ten water samples were taken from the wetlands and each sample was was tested for the aforementioned data. After the truck stop opened, ten more samples were taken from the wetlands and tested again. The results show that the truck stop has slightly negatively affected the quality of the water in the wetlands. These results support my hypothesis.
Molly Caballero, Lucy Derrick, & Ava Rosenbaum

Consumer Science

HOW DO TRAITS DIFFER BETWEEN GMO AND ORGANIC APPLES, POTATOES, AND CORN

The purpose of this project is to determine if there is a difference between taste, appearance, glucose level and daily decrease in mass and diameter of genetically modified and organic apples, potatoes, and corn. The reason this is being researched is because many people are switching to eating only organic fruits and vegetables without knowing all the facts. The tests that are being performed are taste and appearance, rate of decomposition, and the glucose level. The decomposition will be measured by how much the diameter and mass decreased per day over a 2 week period. These tests will be performed on both the organic and genetically modified fruits and vegetables. The hypothesis is that there will be a significant difference between taste, appearance, glucose level, and daily decrease in mass and diameter of GMO and organic apples, potatoes, and corn. The null hypothesis is that there won’t be a significant difference between taste, appearance, glucose level, and daily decrease of mass and diameter of organic and GMO apples, potatoes, and corn.

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Evan Barker, Luke Gabel, & DuBose Tuller

Engineering

THE EFFECT OF THE BICYCLE SAFETY DEVICE ON HOW FAR AWAY A CYCLIST CAN DETECT A CAR BEHIND THEM.

The purpose of this study was to determine the effect of a device called the Bicycle Safety Device (BSD) and the use of headphones on how far away a cyclist can detect a car behind them. Research was done on the topic of bicycle safety because road biking can be very dangerous at times. Studies show that most bicycle related accidents happen due to the driver not seeing the cyclist or the cyclist not knowing of the driver. The Bicycle Safety Device aims to prevent that problem by alerting the cyclist. This will then allow for the cyclist to avoid the driver. The Bicycle Safety Device or BSD is an object sensor that alerts the cyclist, with a loud beep and flash of light, when a car gets close. The BSD was tested in multiple environments including the cyclist wearing headphones. Testing the BSD involved going onto a long straight road and having a car randomly approach the cyclist. The cyclist would then stand up if the BSD noticed the car. The headphones had a major effect on the cyclist, The car sometimes even passed them. The BSD was successful in many situations presented, but did not statistically increase cyclist’s detection of the vehicle.
Mary Martha Beard & Julia Faulds
Consumer Science

THE EFFECT DIFFERENT FLAVORS OF ICE CREAM HAVE ON THEIR MELTING RATE

The purpose of this project was to test the effects that the flavor of Southern Home ice cream had on the rate of which it melts. To conduct this experiment, a tablespoon of each flavor of ice cream was placed into a funnel into a graduated cylinder that collected the volume of ice cream melted. Ten samples for each flavor were placed in an incubator set at 50º Celsius for 10 minutes. After testing this procedure for vanilla, chocolate, and strawberry ice cream, the data displayed that the ice cream melted in descending order of strawberry, chocolate, and vanilla. In conclusion strawberry ice cream melted the slowest, followed by chocolate ice cream, and vanilla ice cream, due to the content of strawberry chunks, which caused the ice cream to melt significantly slower than chocolate and vanilla. The chocolate ice cream melted slower than vanilla due to the cocoa powder and higher fat content. Vanilla melted the quickest because it had a lower fat content and a higher water content which causes ice cream to melt quicker.

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Philip Brewer
Physiology & Health

ENDOSCOPIC THIRD VENTRICULOSTOMY VS VENTRICULOPERITONEAL SHUNTS: A META ANALYSIS OF TREATMENT OF OBSTRUCTIVE HYDROCEPHALUS FROM AQUEDUCTAL STENOSIS

The purpose of this research is to determine if Endoscopic Third Ventriculostomy treatment for obstructive hydrocephalus from aqueductal stenosis (AS) has a lower mortality rate than that of The more mainstay treatment of Ventriculoperitoneal shunts. The hypothesis is that ETV has a lower mortality rate than VP shunts when treating children with obstructive hydrocephalus from AS. The procedure for my analysis was to use other studies conducted on treatment of Obstructive hydrocephalus from AS. with both ETV and VP shunts. The data found within this research comes from Over 12 different sources and over 500 patients from each procedure. Once the data had been collected it was compiled into one succinct chart revealing both the mortality rate solely based on death and the mortality rate based on all factors affecting outcome of the surgery. The results showed that when purely looking at numbers VP shunts are the better option which supports the null hypothesis that VP shunts have a lower mortality rate than ETV. In conclusion however, neither VP shunts nor ETV should treat this form of hydrocephalus alone. The child should first have a VP shunt procedure until an MRI scan shows there is enough room to guarantee a successful ETV. More data is needed to prove that this new proposition is worth considering.
EXPANSION OF A HELMET’S EFFECTIVE DENSITY EFFECT ON AMOUNT OF LINEAR ACCELERATION EXPERIENCED INTERNALLY

The impulse of two objects is always conserved in an impact, however this does not mean that all of the impulse must be felt or experienced by a partaking internal figure. During any given football practice or game, concussion is a possibility, as players often exchange blows to the head and neck area, whether legal or not. Forty-seven percent of the three and a half million concessions reported in 2015 occurred during high-school football, according to Headcase (www.headcasecompany.com). Modern helmets are simply insufficient in protecting the brain against concussion. Greater public awareness about the risk and consequences of concussion, as well as better understanding of concussion’s long-term effects has shined new light on the topic recently. By increasing a helmet’s padding effective density (thickness), you allow for more time between the initial external collision of the helmets, and the acceleration of the brain internally which leads to concussion. The time increase between the internal and external accelerations, should allow for lesser peak accelerations felt by the brain, according to the formula: change in time equals mass times change in velocity, as a greater time will mean a lesser peak force exerted internally. The null hypothesis, stating that an increase in effective density would not have an effect on accelerations internally was not able to be rejected, because an ANOVA test of the data showed no statistical difference; however, a bar graph of the different means did suggest that there is possibly a correlation.

THE COMPARISON OF THE NUMBER OF BACTERIAL COLONIES ON COMMON FLOOR SURFACES VERSUS EVERYDAY SHOES

In this experiment, the number of bacterial colonies in everyday shoes versus common floor surfaces was compared. This experiment means to provide scientific reference for determining where it is “cleanest” to put one’s feet. In broader sense, specifically in underdeveloped countries, this experiment aims to increase interest in providing the right kind of shoes for those who can’t afford them based off of the amount of bacteria growing in surfaces that people come into contact with every day. It was hypothesized that the everyday shoes would generally have a greater number of bacterial colonies than the common floor surfaces, and that the close-toed shoes would promote bacterial growth more so than the open-toed shoes. In order to perform the experiment, ten participants provided one close-toed shoe and one open-toed shoe to be swabbed for bacteria. Additionally, bacterial swabs were taken of two floor surfaces. The bacteria was observed in dehydrated nutrient agar that was dissolved in boiling water and cooled in petri dishes. The bacteria colonies were counted using the Colony Counter App on an IPhone. Overall findings supported the hypothesis: the everyday shoes generally had a greater number of bacterial colonies and the number of bacterial colonies in close-toed shoes exceeded that of open-toed shoes. The results were analyzed using several single ANOVA tests comparing different independent variables, which revealed that some comparisons had statistical significance. The overall results were displayed in column charts.
Flinn Christian

Botany

THE EFFECT OF THE CONCENTRATION PERCENTAGE OF A BICARBONATE SOLUTION ON THE AVERAGE RATE OF PHOTOSYNTHESIS (ET50) (MIN) OF SPINACH LEAF DISCS

The purpose of this experiment was to determine if the concentration percentage of a bicarbonate solution affected the rate of photosynthesis in spinach leaf discs. This project was to understand how these concentrations affect plant growth and determine if this method of floating leaf discs would be able to measure the rate of photosynthesis based on the concentrated solutions. The hypothesis of this experiment was that the 1% concentrated solution would affect the rate of photosynthesis the most by increasing the rate of the process. Out of all of the concentration trials, the rate of photosynthesis increased with each increase in percent concentration. The percent was increased by .2% for each trial until the trials ranged from .2% to 1%. Each trial was set in front of a light source (lamp) and the number of leaf discs that floated to the top of each trial in a span of twenty minutes was written down and recorded. The data was then recorded in Google Sheets and the descriptive, as well as the inferential statistics, were found by running a descriptive test and an ANOVA test. The results showed that there was no significant difference in the number of leaf discs that had floated to the top based on the small intervals of concentrated solution change. Therefore, the hypothesis was rejected. Future research could be done by testing a broader range of percentages in the concentrated bicarbonate solution and also by increasing the number of cups per trial to possibly increase significance.

Townsend Christian & Audrey Osborne

Environmental Science

THE EFFECTS OF SOIL CONTENT ON THE DECOMPOSITION OF A NAPKIN

The purpose of this experiment was to identify which variables placed in the soil sped up the rate of decomposition of a shredded napkin. The different variables in the soil are lumbricus terrestris, Tenebrio Molitor, banana peel, and then a control with nothing in the soil. The hypothesis for the experiment was having Lumbricus Terrestris in the soil will result in the fastest decomposition of a napkin. Three trials were conducted. The experiment was carried out over a course of five weeks. The containers were weighed and had pictures taken of them everyday. After the data was collected, it was analyzed by a single factor ANOVA statistical and analysis test. The data was not statistically significant from each other, but it showed the mass of each container in each trial had decreased. The overall result proved that the original hypothesis was right. The hypothesis stated that adding lumbricus terrestris to the soil would speed up the rate of decomposition the most. After analyzing the data, it revealed that the lumbricus terrestris, in fact, sped up the rate of decomposition of the napkin the most.
Lydia Comer  
Psychology  

THE EFFECT OF DIFFERENT PHOTO LINEUP DESCRIPTIONS OF AN EYEWITNESS TESTIMONY ON IDENTIFYING SUSPECTS IN A CRIMINAL INVESTIGATION

The purpose of this experiment is to test whether computer generated descriptions or eyewitness testimony descriptions are more accurate in a photo lineup when attempting to choose the correct suspect. This will be tested by showing the subjects three different real life cases and mock photo lineups, each consisting 6 photos, four of which are filler photos and the remaining two are photos of the innocently convicted suspect and the guilty suspect. All subjects saw the same three photo lineups and background information of the real life criminal case and trial, however one group was presented with the eyewitness testimony describing the suspect and the other group was presented with a computer generated description. The subjects then chose who they best thought matched the description that corresponded with their group for each lineup. The hypothesis is that if subjects are given the computer generated description, then they will be more likely to choose the correct suspect in the photo lineup. The null hypothesis is if subjects are given the description from the eyewitness testimony, then they will be more likely to choose the correct suspect in the photo lineup. The two control groups proved that there in fact was not a significant difference between the two descriptions, thus rejecting the hypothesis that the computer generated description was more accurate. The null hypothesis was also rejected, that the eyewitness testimony would be more accurate, because the data showed no significant difference.

Ryan Davis & Andrew Sobel  
Consumer Science  

SELF-FREEZING LIQUID: THE EFFECT OF THE LIQUID TYPE AND TRIAL TIME ON THE FREEZING TIME OF A LIQUID

Snap-freezing, the scientific phenomenon of supercooling liquids, can be seen as a party trick on major social media platforms such as YouTube. This experiment was conducted by the need to replicate a successful demonstration of snap-freezing water. This experiment demonstrates snap-freezing of water. Snap-Freezing is the process by which an object is rapidly frozen using dry ice, an ice/salt mixture, or liquid nitrogen. The rate of Snap-freezing of other liquids were then compared to that of water. The other liquids measured were carbonated drinks: Coca Cola, Coca Cola Zero, and Caffeine-Free Diet Coke. The carbonated drinks do not contain the same ingredients and specifically, sugar varied among the three drinks. Trials were ran with each liquid submersed in an ice and kosher salt mixture for 75 and 90 minutes. Slamming on the table was video recorded with Surface Book. The rate of Snap-freezing for each trial was determined using Google Sheets and Logger Pro. Some of the carbonated beverages froze faster than the water. The actual act of Snap-freezing liquids has entertainment values.
THE EFFECT OF THE RATIO OF SURFACE AREA TO VOLUME ON THE RATE OF DIFFUSION IN AGAR BLOCKS

The purpose of this experiment was to determine how increasing the Surface Area to Volume ratio (SA:V) affected the rate of diffusion in agar blocks. This relationship was tested to prove that a high SA:V ratio allows for the most efficient function of an object or organism. For example, a high SA:V ratio is used in the body to help cells faster perform reactions. When baking, often holes are put in the pastry so as to allow the pastry to cook faster because the heat will diffuse through the pastry faster since it has a greater surface area. The procedure consisted of three parts. Solutions of NaOH and HCl were made. Then agar was made and mixed with Phenolphthalein (PPT), a pH indicator that turns pink in basic solutions. NaOH, a basic solution, was added to the PPT soaked agar to make the agar a bright pink color. Different sizes of agar were cut out with different surface areas and volumes after they had turned a uniform pink color. Beakers were filled with HCl, and the agar blocks were dropped into the beakers. The time it took for the blocks to become clear was noted. The results of the experiment supported the hypothesis because the cubes with the largest SA:V ratio had the quickest rate of diffusion.

THE EFFECT OF SURFACE AREA ON DIFFUSION

The purpose of this experiment was to determine the effect of increased surface area on the rate of diffusion in cells. In order to time the rate of diffusion, gelatin was made containing the pH indicator, phenolphthalein. Once the gelatin had solidified, it was infused with NaOH which turned the gelatin a bright pink color. Then two sets of cubes were cut from this gelatin, one set with their surface area increased and one without increased surface area. The cubes varied in volume. The cubes were then placed in containers of HCl which slowly turned the cubes clear. Each cube was timed to determine how long it took for the HCl to fully diffuse throughout the gelatin. This procedure was repeated in three different trials. The results of the ANOVA test showed that the difference in the rates of diffusion between the cubes with increased surface area and those without increased surface area was not statistically significant. This could mean that the surface area was not increased enough for there to be a statistical difference but future study could find the best methods of increasing surface area.
Ben Feldman  
Psychology  

HOW FURTHER INTERNET USE ACCELERATES FUTURE INTERNET USE

The purpose of this experimentation is to assess the impact of how internet use to retrieve information influences how we access future information. Use of search engines such as Google to answer difficult questions results in an artificial dependence on internet usage to answer trivia questions which the subject should be able to answer. With easy accessibility to the internet subjects were potentially more likely to become cognitively dependent which may interfere with their future ability to independently process information. This dependence could decrease cognitive performance and productivity when the internet is not available. The current experiment is an extension of a previous study by Benjamin Storm et.al. This study was designed to see if the same results were true in a high school population. The initial hypothesis was that if high school students were given the choice of using the internet or their own memory to answer a set of questions, then the students would depend upon the internet instead of their memories to answer the trivia questions. However, the opposite appeared to be true because the null hypothesis was supported by the results of this study.

Spears Goodlett & Jackson Pringle  
Physics

THE EFFECT OF VARIOUS GOLF BALL TYPE ON DISTANCE TRAVELED

In this experiment, the effect of the price and brand of golf balls were tested and it was determined whether specific brands would be needed to increase one’s success rate or total meters in one round of golf. A total of three people were included in the testing of this project, an inexperienced player, an average player and an experienced player. For the purpose of this experiment, there was no player who had below and 8.0 handicap, which translates to around a pro level. Each player hit a total of 20 shots with each ball over the course of 2 testing days. The club used to hit the ball was selected as one of the most neutral clubs in the game of golf, the sand wedge. The club’s loft, or angle of the club’s face, was 54 degrees. The three subjects were selected specifically from their certain skill level and experience in the game of golf. It was determined if price and various golf ball brands factor into the total distance traveled in one shot. After reviewing the data it was determined that there was a variance, and the ANOVA test corroborates this, but it was not enough to determine if it was significant to the ball.
THE EFFECT OF THE NUMBER OF TIMES THE BATTERY IS CHARGED ON HOW LONG THE CHARGE LASTS

The purpose of this experiment was to find out if the number of times a rechargeable battery is charged decreases the length of time the battery will hold its charge. It was hypothesized that if a rechargeable battery is charged multiple times the length of the time the charge will last will decrease. Eight rechargeable batteries were charged, for one hour and thirty minutes then tested to find the initial voltage. After finding the voltage the batteries were placed into one of four hair trimmers, to run down the charge. A camcorder was used to film the exact time the hair trimmers turned off. A timer was also started as a backup. After the batteries had fully run down, when the trimmers had fully shut off, the voltage was tested again, this was repeated five times with both sets of four batteries. The data showed that the length of charge decreases as the number of re-charges increase. Thus the data was conclusive, leading to a conclusion that rechargeable batteries lose charge as they recharge.

Riley Haywood & Noah Schumacher

THE DIFFERENCE IN AMOUNT OF ETHANOL PRODUCED BY PORTOBELLO AND SHIITAKE MUSHROOM CELLULOSE

Two common types of mushrooms, the Portobello and Shiitake mushrooms, were used to see which mushroom produced more cellulosic ethanol. The hypothesis was if the enzyme Cellobiase reacted with cellulose from Shiitake and Portobello mushrooms, then Portobello would produce more ethanol. The results of this study did support the hypothesis. In this study Portobello mushrooms produced almost 20 times more ethanol. A Bio Rad Labs Biofuel Enzyme Kit was used to measure the amount of p-Nitrophenol produced by these mushrooms. p-Nitrophenol was then used as an indicator of a proportional production of ethanol. This result means that there is a potential to use Portobello mushrooms to process cellulosic ethanol for possibly making fuel for vehicles in the future.
THE EFFECT OF DIFFERENT COLOR LIGHT AFFECT THE GROWTH OF PLANTS.

The purpose of this experiment was to find out how different color of lights affect the growth of plants. Six of different colors lights were set for the plants, and therefore the results would shows which light would produce the highest plants, which means let the plants absorbs the most lightning energy. The subjects used in this experiment were under the color gel, and let the subjects grew for a month, and compare the data on different height of the plants. The hypothesis of this experiment was, the plants under purple light would have the highest length in. The results of this experiment didn’t support the hypothesis. In conclusion, this experiment will help the farmers, by using which light would make plants grew well.

THE EFFECTS OF ADDING DIVOTS TO THE HULL OF A BOAT ON ITS DRAG

The purpose of this experiment is to identify the effects on the drag of a boat caused by adding small divots across the hull. This experiment was performed by having two boats made out of metal using the same proportions, one with small divots placed evenly across the hull and the other having a flat hull. These boats were then connected to a string that ran from the boat to a weighted pulley that would pull the connected boat through water. The amount of time it took for the weight to hit the ground was measured using a stopwatch. The speed of the weight falling would correlate to the speed of the boat moving through water. The faster the weight fell, the faster the boat traveled. The speed of the boat would be determined by how well it traveled through the water. This means that a boat with a lower drag would go faster than a boat with a higher drag. Although the ANOVA analysis of the data suggests variation between the two data sets, the difference was not enough to be considered statistically significant. Thus the results of the experiment support my null hypothesis, Adding Divots to the hull of a boat does not seem to decrease drag.
THE EFFECT OF MUSIC GENRE AND VOLUME ON A PERSON'S HEART RATE AND REACTION TIME

In this research project, the effect of music genre and volume on a person's heart rate and reaction time were examined on 24 driving age participants. The purpose of this experiment is to investigate the effect of music on a driver's ability to stay focused. It was hypothesized that higher volumes and more intense music would lead to increased heart rates and reaction times. The students performed three trials on each subject, over a span of a couple days, with the same genre of music so that all trials could be averaged and analyzed using an ANOVA test. Three different volumes were tested with a different song used for each volume to see if any changes would occur in heart rate or reaction time. The researchers found that in the pop genre there was no significant difference in heart rate between volumes, however, there was a statistically significant difference in reaction time. There was no statistically significant difference in heart rate between volumes, or reaction times when reviewing the data from the Hard Rock subjects. Concerning the classical genre, there was no statistically significant difference in heart rate between volumes or in reaction time, though the numbers follow the same trend as pop and hard rock. In conclusion, the researcher’s hypothesis was not fully supported for all genres and volumes. In most cases, the heart rate of the test subjects did not increase with volume or a more intense genre.

Chris Lou
Computer Science
THE EFFECT OF DIFFERENT MATERIALS ON BLOCKING CELL PHONE SIGNAL

The purpose of this experiment was to investigate the effects of various materials on their ability to block cell phone signal. Five different materials were compared, steel, tin, wood, glass, and plastic. The five materials were in the form of boxes, and they were used as cell phone signal blocker. Therefore, the results of this study could be used to determine which material would weaken the cell phone signal the most. The hypothesis of this experiment is that tin would have the most negative impact on cell phone signal strength. The results of this experiment supported the hypothesis. In conclusion, this experiment could benefit people by knowing where they should choose to go when they need stronger cell phone signal.
Ben Mathews  
Microbiology  
THE EFFECT OF ANTIBIOTICS ON THE PROTEIN CHANGES IN E. COLI.

The purpose of this research is to study the relationship between E. coli exposure to Penicillin and the protein changes taking place when complete antibiotic resistance is achieved, as well to test the concept of whether there is a relationship between protein changes and antibiotic resistance. The type of bacteria that was used was E. coli, and there were 4 different cultures that each built up resistance independent of the others. Antibiotic resistant bacteria are an emerging problem in developed and developing countries, so this research aims to provide insight into a possible link between antibiotic resistance and bacterial proteins. The E. coli strain used was OP50 and the E. coli was spread onto petri dish plates filled with RAPID'E.coli 2 Agar, and then a Penicillin disk was immediately placed onto each plate. After the 4th generation of repeating this process, the bacteria were collected and gathered for an SDS-PAGE protein electrophoresis. The hypothesis for this experiment was that if the E. coli bacteria are repeatedly exposed to the Penicillin antibiotic, then the surviving bacteria will exhibit resistance to Penicillin and a change in their protein structure. The experiment presented limited results that were not sufficient evidence to support my hypothesis or null hypothesis. In conclusion, the results suggest the methodology used is valid, but there was not a sufficient amount of data collected to prove or disprove the idea that protein changes in a bacteria can be linked to the exposure to Penicillin that these bacteria endured.

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Clay Mitchell  
Engineering  
THE EFFECT OF TEMPERATURE, PRESSURE, AND HUMIDITY ON EMF SIGNALS

The purpose of the experiment was to find a pattern in EMF reading related to temperature, pressure, and humidity. The results of this study suggest that that EMF readings varied because of pressure, temperature, and humidity. The hypothesis (H1) stated that if the temperature is above 15° C and the pressure is greater than 760 mmHg, then the EMF reading should be stronger. The results supported H1; the EMF at all locations was related to temperatures. The EMF was related to pressure at the library and humidity at the middle school. The hypothesis (H2) stated that if the temperature is above 15° C the pressure is greater than 760 mmHg and humidity is above 24%, then the EMF reading should be weaker. The results of this study also supported H2; EMF readings were impacted by by humidity at both the library and the center of campus, and pressure at the middle school. The null hypothesis (H0) stated that if the temperature is above 15° C the pressure is greater than 760 mmHg and humidity is above 24%, then there would be no change in the EMF readings. H0 at the center of campus was supported by pressure.
THE EFFECT OF DIFFERENT HEAVY METAL ACETATE SOLUTIONS ON THE INHIBITION OF CATALASE ENZYME

The purpose of this experiment was to determine the effect of different aqueous solutions of ionic compounds on the rate of reaction of the enzyme catalase. The hypothesis states that zinc and cadmium acetate solutions will significantly inhibit catalase and its ability to produce oxygen. In the experiment, there were five trials performed with the lead acetate, zinc acetate, acetic acid, cadmium acetate, and distilled water (the last being the control group). In order to calculate the results, the ANOVA single factor test was used, comparing each solution to water. From results of the ANOVA test, it was found that the lead acetate, zinc acetate, and the acetic acid all significantly reduced the rate of reaction of the enzyme catalase, while cadmium acetate did not.

THE EFFECT OF CALORIC LABELING ON CONSUMERS CALORIE INTAKE

While the addition of calorie count on restaurant menus may seem insignificant, previous studies have shown that the addition of calorie count can lead consumers to choosing a healthier meal. The purpose of this experiment was to investigate the impact caloric labeling on a menu can have on a consumer’s choices. The independent variable was the menu type, either labeled or not labeled. The dependent variable was the calorie intake. For this study the hypothesis was, if a menu includes calorie count, then the subjects viewing the menu will consume less calories than subjects ordering off the menu without calorie count. The null hypothesis was, if a menu includes calorie count, then the subject viewing the menu will consume the same number of calories as subjects ordering off the menu without calorie count. Out of the forty participants, the first 20 were asked to choose one entree and one drink off of a menu that had calorie labeling, and the other 20 participants were asked to choose one entree and one drink off the not labeled menu. Next, the calories ordered from participants off of the two menus were compared and a T-Test was conducted. The results suggest that on average, participants who had a menu with calorie count ordered fewer calories than participants ordering off of the not labeled menu. The results were proven to be statistically significant and the null hypothesis was rejected.
Hailey Nicks
Botany

THE EFFECT OF DIFFERENT LEVELS OF CAFFEINE ON THE GROWTH OF WISCONSIN FAST PLANTS

The purpose of this experiment was to study the effects of various concentrations of caffeine on the growth of Wisconsin Fast Plants. Five different caffeinated liquids were compared in the study, coffee, green tea, chai black tea, vanilla spice chai tea, and 5 Hour Energy. The effects of the five liquids were compared to those of the control group. The plants were set up to absorb a mixture of water and eight ounces of the respective caffeinated liquid, or in the case of the 5 Hour Energy, two ounces, and were left to grow for four weeks. The hypothesis was that the 5 Hour Energy will enhance the growth of the Wisconsin Fast Plants by the largest amount, due to the drink containing the highest levels of caffeine when compared to the other substances in use in the experiment. The results of the experiment supported neither the hypothesis nor the null hypothesis, as the coffee group showed the greatest growth, on average, out of all of the plants. In conclusion, this experiment could prove to be beneficial for plant growth, and determining if different caffeine concentrations could possibly act as a sort of stimulant for botanical growth.

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Kathleen Powers
Environmental Science

THE EFFECT OF GREYWATER ON THE GROWTH OF LEPIDIUM SATIVUM AND SOIL QUALITY

This experiment studied the effect of greywater on the growth of Lepidium sativum, garden cress, and soil quality. 54 pots were filled with 3 ½ inches of soil and 25 garden cress seeds were sprinkled in each pot. The pH of the soil was taken using a pH meter before watering started. 27 pots with seeds were watered with greywater and 27 pots with seeds were watered with tap-water every other day for 16 days. The average height of growth was measured for each water type with a ruler every other day. Final pH measurements and hydrophobicity tests were conducted 5 days after watering finished. To determine hydrophobicity, .3 inches of soil had individual drops of water released onto the surface. If water was not immediately absorbed, it is hydrophobic. The hydrophobicity test was run for each pot. It was hypothesized that the growth of greywater and tap-water samples would have no significant difference, soil exposed to greywater would have a higher pH than soil exposed to tap-water, and greywater soil would be hydrophobic. The results supported part of the hypothesis because there was no significant difference between growth of plants watered with greywater and plants watered with tap-water, the soil exposed to greywater had a higher final pH than the soil exposed to tap-water, but neither soil group was hydrophobic which is contrary to what was hypothesized.
Caroline Quan
Psychology

THE EFFECT OF ORGANIC LABELING ON TASTE PERCEPTION

The purpose of this experiment was to examine the impact of organic labeling on taste perception. The organic market is growing, therefore the use of organic labels, or eco-labels, are also increasing. The results of this study show how the use of organic labels can change the way people taste two identical pieces of food. The subjects used were asked to taste two identical, conventional brownies, one was labeled “organic,” one labeled “non-organic,” then asked if they preferred the taste of the “organic” brownie, the “non-organic” brownie, or if they tasted the same. The results of this experiment supported the hypothesis; if conventional food is portrayed as organic, then people will taste a difference. In conclusion, this experiment will educate and help people understand the impact of organic labeled food on their taste perception.

Lily Richter
Physiology & Health

WHAT IS THE CORRELATION BETWEEN POOL CHEMISTRY AND A SWIMMER’S HEALTH?

The purpose of this study was to determine the relationship between the chemicals in swimming pools and the swimmer’s health. It was hypothesized that if the pool chemistry and a swimmer’s health are monitored, there will be a correlation. The five main elements for testing water quality in swimming pools in the United States include testing free chlorine, total chlorine, bromine alkalinity, pH, and hardness levels. Over the course of 11 days, the pool chemistry in the competition pool at the University of South Carolina was tested using pool test strips. After the pool chemistry was tested, swimmers were asked to fill out a survey about certain health symptoms that they experienced while swimming in the pool. After analyzing the data, it showed that when the pool’s chemistry was within the optimum levels, the amount of health issues (i.e. itchy skin or eyes, earaches, or respiratory issues and cough) decreased and when the pool chemistry was outside the optimum levels, the amount of health issues increased.
Faith Robertson  
Psychology

THE RELATIONSHIP BETWEEN GRADE LEVEL AND THE STROOP EFFECT

The purpose of this experiment was to test the relationship between grade level and the Stroop effect. The goal was to find out whether or not the Stroop effect is caused by a cognitive interference between the second nature of reading and the color identifying processes. (Besner et. al. 1997) The Stroop effect is the automatic brain process of humans’ tendency to name the word as it reads, rather than the color ink of the word. For example, if the word “orange” is printed in green ink, it is much more difficult to identify the color of the ink, green, than the color the word reads, orange. This is an example of an incongruent word. When the word and ink color are the same color, it is known as a congruent word. The test subjects were in ninth grade, second grade, first grade, kindergarten, and 4 year-old preschoolers. By testing younger students, the second nature of reading was eliminated, so it was hypothesized that younger students would take longer identifying congruent words, but be quicker than older students in identifying incongruent words. However, the results are a stark contrast to the hypothesis because in this study ninth graders had shorter times in all categories. This result questions the commonly believed theory that the Stroop effect is caused by a cognitive interference.

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Amelia Robinson-Brown  
Botany

THE EFFECT OF CONCENTRATION OF CO2 ON THE AVERAGE RATE OF PHOTOSYNTHESIS IN SPINACH LEAF DISKS

The purpose of this experiment was to determine the effect of carbon dioxide concentration on the rate of photosynthesis in spinach leaves. Small circular disks were cut out of the spinach leaves using a standard hole puncher. Then solutions of differing concentrations of carbon dioxide, 0.2%, 0.4%, 0.6%, 0.8%, and 1.0%, were all prepared, and each solution was spread equally among five cups. There was also a control solution that contained only water. The gases were then sucked out of the spinach leaves with a syringe using a specific technique to create a vacuum. Ten leaf disks were then placed per cup per concentration, giving a total of 50 leaf disks per concentration. The cups were then exposed to light for 20 minutes, and the number of disks floating in each cup was measured every minute. Results were calculating by finding the ET50 for each concentration. The ET50 is the time it takes for 50% of the leaf disks to float and is a good indicator of the rate of photosynthesis. It was hypothesized that if the concentration of carbon dioxide was increased, then the rate at which photosynthesis will also increase. The null hypothesis was that the concentration of carbon dioxide will have no effect on the rate of photosynthesis. The results of the experiment supported the hypothesis. So, there is a direct relationship between CO2 concentration and the rate of photosynthesis.
Riana Shelly  
Physiology & Health  
THE EFFECT OF GLUCOSE ON THE LACTASE ENZYME

The purpose of this study was to determine the effect of dairy and ‘lactose-free’ products with respect to the amount of glucose and/or galactose. Seven types of milk were tested: three soy milks, three whole milks and one plant based milk. The most natural way for lactose intolerant people to comfortably consume lactose is by an extra presence of glucose in the dairy product, but many times companies modify their products differently, for different reasons. Each milk was tested five times: three times at the initial temperature, once with a lactase supplement drop, and once at room temperature. Almost every time, the supplement and temperature change did not give a different outcome than the trials previously. The milk was tested with a glucose strips used primarily for diabetes. The strip was dipped in the milk, exposed to the air for thirty seconds and the color of the strip was compared to the scale on the side of the bottle. The scale used percentage as the form of measurement, going from 0% to 5% with \( \frac{1}{10}\% \), then counting up by one. The hypothesis of this study is if the dairy products are lacking lactose, then the glucose strips will not be positive (to some percentage). The hypothesis was supported by the experiment. In conclusion, lactose intolerant people will benefit by knowing which products have the most glucose.

Trevor Squirewell  
Physiology & Health  
THE CORRELATION BETWEEN COMMON LIQUID CONDUCTIVITY, BLOOD CONDUCTIVITY, AND CRAMPS.

The purpose of this experiment was to determine the conductivity of common liquids used by athletes and to see if there is a correlation between the conductivity of the drinks along with blood conductivity and cramps. To begin the experiment, 5 common liquids were chosen: Water, Gatorade, Low Calorie Gatorade, Pickle Juice, and Powerade. These liquids were chosen because they are common liquids used by athletes to quench thirst, replenish electrolytes, and relieve cramps. The conductivity of each of the liquids were tested to see if there was a correlation between electrolytes present and conductivity of drinks. It was hypothesized that the liquid that contained the most electrolytes would have the highest effect on the conductivity reading. The results showed the the liquids that did have the highest amount of sodium and potassium electrolytes also had the highest conductivity reading. This supports the hypothesis. The Gatorade and the low calorie Gatorade had the highest conductivity readings while pickle juice came next. To conclude this means that if one were to have cramps, Gatorade would be the best source of relief.
Paris Tomlin  
Zoology  

THE EFFECT OF ENVIRONMENTAL CHOICES ON LADYBUG BEHAVIOR

The purpose of this experiment is to determine ladybug behaviors by examining environmental choices of the ladybug. The experiment began by preparing choice chambers for the coccinellids. Twenty to forty ladybugs were added into the choice chambers with distilled water, the control, being on the “B” end and either distilled water, melon, mustard, or ethanol, levels of the independent variable, on the “A” side of the choice chamber. The ladybugs were given five minutes of undisturbed time. After five minutes, the numbers of ladybugs were counted on both the A and B sides of the choice chamber. After data analysis, it was revealed that the ethanol repelled the highest number of ladybugs and melon attracted the most number of ladybugs. It was hypothesized that if fruit (melon) is inside of the choice chamber, then the taxis of the ladybugs will be greatest. The hypothesis of the experiment was supported because the taxis, or attraction, of the ladybugs was greatest in the melon choice chamber. The results of this experiment are statistically significant, and the variation between the different levels of the dependent variable is the result of the independent variable.

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Bangjie Xue  
Physics  

THE EFFECT OF DIFFERENT KINDS AND AMOUNT OF GRANULAR MATERIAL ON THE STABILITY OF A BALL ROLLING DOWN AN INCLINED RAMP.

This experiment determined the relationship between different volume of granular material filled in a one eighth increment of the diameter and the minimum start angle of a ball on an inclined ramp. The result suggests that there is a relationship between different volume of granular material and the starting angle of the ball. The angle that required to start the ball from rest increased as the material inside decreased. However, when the granular material reached a minimum point, the angle decreased largely. The independent variable was the amount and types of granular materials inside the ball, and the dependent variable was the minimum angle required to start the ball from rest. The result of this study can help determine the stability of a non-filled container.
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Barker, Evan  Merritt, Olivia
Beard, Mary Martha  Mitchell, Clay
Brewer, Philip  Mullins, Kit
Buchanan, Davis  Murali, Athreya
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## Consumer Science – Non -mentored

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| Mary Martha Beard, Julia Faulds | THE EFFECT DIFFERENT FLAVORS OF ICE CREAM HAVE ON THEIR MELTING RATE |
| Ryan Davis, Andrew Sobel, | SELF-FREEZING LIQUID: THE EFFECT OF THE LIQUID TYPE AND TRIAL TIME ON THE FREEZING TIME OF A LIQUID |
| Allison Hall | THE EFFECT OF THE NUMBER OF TIMES THE BATTERY IS CHARGED ON HOW LONG THE CHARGE LASTS |
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| Evan Barker, Luke Gabel, DuBose Tuller | THE EFFECT OF THE BICYCLE SAFETY DEVICE ON HOW FAR AWAY A CYCLIST CAN DETECT A CAR BEHIND THEM. |
| Clay Mitchell | THE EFFECT OF TEMPERATURE, PRESSURE, AND HUMIDITY ON EMF SIGNALS |

## Environmental Science-Non-mentored

| Madeline Ashcraft | THE EFFECT OF THE LOVES TRUCK STOP ON THE TEMPERATURE, PH, MERCURY, DISSOLVED OXYGEN, AND TURBIDITY ON THE NEARBY WETLANDS |
| Townsend Christian, Audrey Osborne, Kathleen Powers | THE EFFECTS OF SOIL CONTENT ON THE DECOMPOSITION OF A NAPKIN |
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Heathwood Hall Science

Jim Morris
Department Chair
Biology, Anatomy & Physiology
Honors Research,

Jason Chiu
Biology, AP-Biology, Biotechnology
Honors Research

Tim McKnight
Physics-1, Honors Physics-1, AP-Physics

Laura Slocum
Chemistry, Honors Chemistry
Honors Research

About Christian Graves:
Christian is a native of Upstate SC. He attended Winthrop University, was a fellow at the prestigious National Institutes of Health, and is currently pursuing his PhD-MD at USC School of Medicine. His interests are in entrepreneurial science and at the intersections of neuroscience, immunology, and oncology. He is an avid leader as a Board member of SCBIO, a manager, silicon valley consultant, published author, and he co-founded CBG to bolster the pipeline of innovators and entrepreneurial leaders in the Carolinas.

Graves is driven by building diverse teams to catalyze innovation and looks forward to promoting translational science with CBG and his startup lmbk.

For more information:  https://www.carolinabiotechgroup.com/boardofdirectors/

Wednesday March 22, 2017
&
Thursday March 23th 2017

Concurrent 20 minute Sessions