



70th PITTSBURGH REGIONAL SCIENCE & ENGINEERING FAIR

SENIOR DIVISION PROJECT ABSTRACTS

APRIL 3, 2009

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Note: Additional projects may have been added after the printing of this book. Omissions should not be considered as a negative reflection on the student or their project.

SENIOR DIVISION – BEHAVIORAL AND SOCIAL SCIENCE

Project Number: SBS001

Grade: 12

Title: How Long Will You Hang On?

Abstract: The purpose of this experiment was to determine the level of difficulty of a game that most effectively retains the attention of its players. The procedures consisted of creating a hangman computer game with three levels of difficulty, having three groups of test subjects play the game, and determining which level retained the players' interests for the longest amount of time. The data showed that a win rate closest to 50% tended to captivate players' attentions most successfully. Another conclusion drawn was that the reason people decided to play games most likely had an effect on their decision to stop.

Project Number: SBS002

Grade: 10

Title: The Effect of Cogitation Prior to Assessment of Students

Abstract: The purpose of this experiment is to test the hypothesis that cogitating (studying) prior to an assessment has no affect on the performance of the student. Students were given 5 minutes to cogitate before one test and given no time to cogitate prior to another test. The results did not support hypothesis.

Project Number: SBS003

Grade: 9

Title: Coloring Your Thoughts? The Stroop Effect.

Abstract: The purpose of my experiment was to investigate the Stroop Effect. I wanted to see some of the effects words have on us. My hypothesis was that "subjects asked to name the color of ink used to print the name ink colors of different words and random letters." Subjects were given different sets of cards and timed. Averaged Data: word/ink same color: 8.1 seconds, word/ink different color: 10.69 seconds, non-color words: 10.09, random letters: 9.57 seconds. Based on my results I concluded that my data supported my hypothesis.

Project Number: SBS004

Grade: 12

Title: Please Don't Stop The Music!

Abstract: Have you ever wondered whether or not listening to music while doing any particular type of work is a wise choice? "Please Don't Stop the Music!" explores these phenomena as well as many others concerning multi-tasking and task switching. Tests were given to students. Some listened to music while others did not. Most of the data collected to date has shown what I hypothesized, that most students, or people in general do not actually do enough work while trying to listen to music at the same time.

Project Number: SBS005

Grade: 10

Title: Can an adult pass a middle school science test?

Abstract: The purpose was to find out if the information learned in school remains after leaving high school. First tests were handed out to the subject with an answer sheet. Then the tests were graded. The data showed that the subjects could pass the tests, but they were rather low in score. Conclusion was that they kept the information over time. The subjects were then subdivided by age to determine if more information was lost as the subject aged.

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The older aged group scores were higher than those for the middle-aged group. The hypothesis was rejected.

Project Number: SBS006

Grade: 12

Title: Which Form of Witness ID Is Most Accurate?

Abstract: Eyewitness identification is often used in crimes to make a case on a suspect; however, it is often inaccurate. This project tested to see which method of eyewitness identification is most accurate: criminal line-up, photograph recognition, a series of questions, and witness recitation of everything recalled from the scene. The hypothesis is that the witness recitation method will be most accurate. Ten subjects were tests after a simulation. The results should show that the witness recitation method will hold higher accuracy rates. Results will be helpful in the criminal justice field and in pending court cases.

Project Number: SBS007

Grade: 10

Title: Can You Remember Words According to Color?

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBS008

Grade: 12

Title: Do Nightmares Change Through the Age Groups?

Abstract: Nightmares are disturbing dreams that affect all ages. The hypothesis for this project is that the nightmare's general fear will depend on the age group of the person. Each person was interviewed regarding their dreams over the past year. Disturbing dreams were matched to models of fears the individuals typically experience at their ages. Results should show there is a correlation between the types of disturbing dreams and age-appropriate fears. Knowing why such dreams occur, people can make progress to understand their fears, which is the first step to solving them.

Project Number: SBS009

Grade: 11

Title: Can You See Me Now?

Abstract: What is the effect of blurred pictures on human recognition? This experiment was tested by blurring pictures into five stages ranging from blurriest to clearest. The pictures were then shown to twenty different people one at a time. The results were unexpected and shocking. On average, the human eye could recognize the objects in the second stage of blurriness. This shows that the human eye can take color and shape and combine them to create an image that can be recognized no matter how blurred the objects may be.

Project Number: SBS011

Grade: 9

Title: Calories Effect on Test Scores

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBS012

Grade: 11

SENIOR DIVISION – BEHAVIORAL AND SOCIAL SCIENCE

Title: The Effect of Video Games on Heart Rate

Abstract: The purpose of this experiment was to find whether or not violent videogames affect heart rate more than non-violent video games. A resting heart rate and a post play heart rate are recorded in a log book. Each subject must play eight games for five minutes each based upon ESRB rating, for three trials. Averages and changes from resting to post play are recorded. The data didn't support the hypothesis since an E rated game, increased heart rate the most. The effect of video games on heart rate may not be determined by the rating of the video game.

Project Number: SBS013

Grade: 9

Title: How to make the cookie

Abstract: My project title is How to make the "best" cookie. The problem was, which cookie is better, the refrigerated cookie-dough cookie or the newly-mixed cookie-dough cookie. My hypothesis was that the freshly-mixed cookie-dough cookies would be preferred more and be softer. For my experiment, I refrigerated cookie-dough for 48 hours and baked it. I then baked newly-mixed cookie-dough. I preformed a taste test. It asked if there was a difference in the taste, which cookie was preferred, and which cookie was softer. The newly-mixed cookie-dough cookies were preferred more, and were softer than the refrigerated cookie-dough cookies.

Project Number: SBS014

Grade: 12

Title: The Effect of Gender on Test Scores

Abstract: Everyone knows males and females think differently. Does this mean they test differently, too? The hypothesis for this project was that men and women will score differently on tests in different subjects. Ten males and females of high school age were studied. They were given timed tests on the subjects of logic, math, reading comprehension, English, science, and memory. The multiple-choice questions were based from the SATs and ACTs. Each subject took the test three times. The results should show the males scored higher in math, reading comprehension, and logic while the females scored higher in memory, science, and English.

Project Number: SBS015

Grade: 12

Title: Sudoku Puzzles: Mind vs. Math

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBS016

Grade: 12

Title: Does the Length of Pro/Con Arguments affect voting behavior?

Abstract: This experiment tests whether or not the length of an argument supporting or opposing an initiative affects voting behavior. A mock election of four ballot questions was administered to 632 students at Southern Garrett High School. Control group ballots were designed with supporting and opposing arguments of equivalent lengths, and Experimental group ballots offered arguments of differing lengths. The Flesh-Kincaid Readability Test was applied to eliminate reading level variability between arguments. The pattern of voting across

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all ballot questions clearly showed that voters tended to favor shorter arguments. Chi-square analysis confirmed the statistical significance of the results.

Project Number: SBS017

Grade: 10

Title: History vs Hollywood

Abstract: My project was to see if students of all grade levels know more people from popculture or history. To do this I went into the history classes and showed up a number of pictures from the history text books and magazines of the people and places.

Project Number: SBS018

Grade: 12

Title: The Effect of Color Scheme on Emotional Response

Abstract: If a picture is worth a thousand words, which is more important: the color scheme or the contents? Does the age of the viewer matter? I used pictures that express a neutral emotion and pictures that express one dominant emotion. I scanned them, applying a separate color scheme to a copy of each of them, and presented them to people of different age groups. They recorded their responses to each picture. I predict that those pictures with the strongest emotions would not be affected by changing the color scheme, while more neutral pictures would be.

Project Number: SBS019

Grade: 9

Title: Does Scent Affect Pulse?

Abstract: The purpose of the experiment was to determine if scent affects a human's pulse. Subjects were asked to sit alone in a room with a lit candle for two minutes. Their pulse was taken before and after sitting with the candle. The data was organized in a spreadsheet. Each subject was asked to repeat the test three times with a different candle each time. The data showed that the vanilla and citrus candles raised the pulse while the pine candle kept the pulse neutral. The conclusion was that scent does affect a human's pulse.

Project Number: SBS020

Grade: 12

Title: Pepsi vs. Sunny Delight

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBS021

Grade: 12

Title: Violent Video Games

Abstract: I hypothesize the project will prove or disprove the common notion that violent video games should be watered down due to adverse effects they have on the player. The subjects will engage in a half hour long session of playing either a family friendly or violent game. The heart rates and blood pressure will be recorded as well as the answers to the psychological questions. I expect to find that violent video games do have an effect on the heart rate and blood pressure.

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Project Number: SBS022

Grade: 9

Title: Project Penguin

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBS023

Grade: 12

Title: How Does Repetition Affect Information Retention?

Abstract: My purpose is to determine whether visual, oral, written, or audio repetition is most effective in terms of information retention for both short and long term memory. Sixty students were assigned to study selected material in one of the four repetition techniques. I assessed each subject twice, once immediately after they studied the material to test short memory retention and again exactly a week later to test long term memory retention. The most effective method can then be applied in real life to studying habits, because this method will yield the greatest amount of studied material remembered.

Project Number: SBS024

Grade: 11

Title: The Effect of Time of Day on Children Learning

Abstract: Do elementary students function better on assignments in the morning or afternoon? I predict math scores will be higher in the morning and reading scores in the afternoon. I believe math will be more interactive for students in the morning and students will be more alert in the afternoon for reading. I would give the students a math sheet in the morning, than an equivalent one in the afternoon and do the same for reading. I expect math grades to be higher in the morning and reading grades higher in the afternoon. These results show when subjects should be taught.

Project Number: SBS025

Grade: 9

Title: Who Saves More? Boys or Girls?

Abstract: The project I did was called "Who saves more? Boys vs. Girls." The purpose of my project was to see if teen boys or teen girls spend more money. I tested this by handing out a survey to fifty boys and fifty girls. I then had to determine all the subject's scores. When I was done with that, I found the average girls' score and the average boys' score. I used this information to classify the subjects as either a tightwad, not conflicted, or spendthrift. I then compared the results to see who spent more money.

Project Number: SBS026

Grade: 9

Title: Dealing With Brrrain Freeze

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBS027

Grade: 9

Title: Visual Stimuli and Retention

Abstract: Please visit student's exhibit for the abstract.

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Project Number: SBS028

Grade: 12

Title: Music's Effect on HS Student's Heart Rate

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBS029

Grade: 11

Title: Calm Down

Abstract: What is the effect of vanilla scent on test subjects? The subjects were taken into an enclosed room and a series of ten questions were asked and ten seconds were allowed to answer each question. Then the time was checked and the data was recorded. The previous steps were then repeated for each test subject. A vanilla scented candle was lit in the test room and five minutes were waited. The previous steps were repeated. The data shows that questions were answered about a half second faster with the vanilla scent. Gender did not have an effect on the final results.

Project Number: SBS030

Grade: 9

Title: Color My Words

Abstract: My science fair project is called "Color my Words." It is based on the theory of the stroop effect. Stroop effect is a demonstration of interference in the reaction time of a task. When a word such as blue, green, red, etc., is printed in a color that is different from the color of the word's meaning, naming the color of the word takes longer and is more prone to errors than when the meaning of the word is the same as its ink color. The subjects participating in my expierement will read off the color of words that are displayed on a poster.

Project Number: SBS031

Grade: 10

Title: Try To Remember

Abstract: The purpose of this experiment is to determine if people can retain more information in their short-term memory if the information is presented in the form of images rather than words. Subjects in the experimental groups viewed one form in Words Format and another form in Pictures Format, but subjects in the control groups viewed two forms in Words Format or two forms in Pictures Format. Each form included six items, and subjects were instructed to recall the color and shape of each item. An analysis of the data indicated that subjects recalled the images better than the words.

Project Number: SBS032

Grade: 9

Title: Use It or Lose It

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBS033

Grade: 9

Title: The Color of Food Matters

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Abstract: The purpose of this experiment was for a school science fair. My research was prompted by my interest in human behavior. My hypothesis was that the color of food and drinks will affect whether or not we like them. Subjects were given foods colored different than would be expected. Nobody refused to try it after they saw it, but they all preferred the expected over the unexpected. I concluded that it does affect people of different ages differently. A possible application would be marketing or food testing, or possibly weight loss.

Project Number: SBS034

Grade: 9

Title: Can this Phenomenon Slow Your Brain?

Abstract: The purpose of this experiment was to test the Stroop Effect. To do so, I gave volunteers four simple shape tests. In these tests I held up four different strips of shapes, shape words, shapes and matching shape words, and shapes and conflicting shape words. I asked the volunteer to name the shapes they see as quickly and accurately as they could. Then, recorded their results down on a table that I later graph. The fourth test took the longest, the one with the shapes and conflicting shape words. In conclusion, yes, the Stroop Effect does slow the brain down.

Project Number: SBS035

Grade: 12

Title: How does color affect human reaction?

Abstract: The purpose of the experiment is to test if different color will or will not have effects on people. First red and blue are chosen to run experiment. The temperature and pulse has been measured. Keep the color for a minute then measure the temperature and pulse again. Record data and analyze. The hypothesis is supported. The red color will increase people's temperature and pulse, the blue color will decrease people's temperature and pulse.

Project Number: SBS036

Grade: 9

Title: Can different foods make left-brained people do right-brained activities?

Abstract: The purpose of the experiment was to determine if when left-brained people eat certain types of foods does it make them want to do right-brained activities. Also when teachers assign right-brained activities can food make students more willing to do them. Subjects were given either peanut butter, cinnamon, lemon, or chocolate. Then they were asked to complete a survey with left-brained and right-brained activities to see which one they would choose. The choices were recorded. The data showed that 50% of the subjects chose chocolate making it the best. My data supports my hypothesis of chocolate.

Project Number: SBS037

Grade: 10

Title: Controversial Topics: Preconceived vs. Fact

Abstract: The experiment was designed to use a six-question quiz to discover whether high school students use their preconceived ideas or factual evidence. The questions were controversial but grade level appropriate. The tests were given to three different science classes. The hypothesis was that students use their preconceived notions. It was concluded that the students answered more questions factually therefore the hypothesis was rejected.

Project Number: SBS038

Grade: 9

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Title: What's the Difference?

Abstract: Objective: My goal is to determine what color of M&M's® will people prefer to eat most often (chocolate color OR multi-color). Method: I presented a tray with small plastic cups containing 2-3 M&M's® in each cup. One cup would contain only chocolate (brown) colored candies and one cup would contain multi-colored candies. I then presented the choice to individuals in my school (goal of 50 participants) and let them select their choice for what they would prefer to eat. I counted the number of times each of the cups was selected using a tally sheet. I offered the candies that were chosen as a reward for participating in my survey to each participant. I determined which 'color' of M&M's® was most popular in my school – chocolate or multi-colored. Results: The final results after pooling 74 individuals who participated in my experiment – 52 people favored 'multi-colored' M&M's® (or 70%) and only 22 individuals (or 30%) favored chocolate colored M&M's®. Conclusion: Unfortunately, my preliminary hypothesis was incorrect. Color really does matter in choices we make for food – especially candy!! I think the next time I will experiment with people's preferences I will explore how gender affects my results.

Project Number: SBS039

Grade: 9

Title: Twirls and Whirls: Who Gets Dizzier?

Abstract: Did you ever wonder if specific athletes become dizzier than other? My experiment let me attempt to answer this question. I performed an experiment to see if athletes who practice spinning on a regular basis (cheerleaders, dancers, gymnasts) would get less dizzy than athletes who do not. I started this experiment by making a chart that consisted of finding out the following: the volunteer's eye movement time, their eye direction, their thumb direction during the experiment, their thumb direction after the experiment, and their rating of dizziness from one to five. For my experiment, I spun five athletes who practice their sport doing spins and five athletes who do not. I then spun them in a chair three times, which were the three tests. The first test was with the volunteers' ears plugged and eyes closed, with a gradual stop from spinning. The second test was with a rapid stop, and the ears still plugged and eyes closed. The third test was with a quick stop with the volunteers' ears unplugged and eyes open. My hypothesis was that the athletes who do not practice spinning on a regular basis would become dizzier than those who do. The experimental results refuted my hypothesis by the athletes who do not spin becoming less dizzy than athletes who do spin on a regular basis.

Project Number: SBS040

Grade: 9

Title: The Stroop Effect. What Is It?

Abstract: For this project I wanted to find out if interference explained the Stroop Effect. For this experiment I, asked a group of adults, high school students, and elementary kids to read what was on the paper I gave them. They were timed first to see how fast they could go and then timed normally. Some of my results were that people had trouble reading it fast then to read it normally. In the end I was able to conclude that it was harder when you have to read the set of words fast then to read it on your own normally.

Project Number: SBS041

Grade: 12

Title: Music's Effect on A Students Memory?

Abstract: Please visit student's exhibit for the abstract.

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Project Number: SBI001

Grade: 9

Title: Effects of Sewage Treatment Plants on Peters Creek

Abstract: To test the hypothesis, sample will be taken from six areas on the stream and the ph, amount and type of aquatic organisms, dissolved oxygen, amount of fecal coliform bacteria, and the temperature of the water will be tested. Litmus paper will be used to test the ph, a dissolved oxygen kit will be used to determine the dissolved oxygen, petri dishes filled with an auger will determine the amount of fecal coliform, a net will be placed and the bottom of the stream will be stirred to find the amount of organisms, and the temperature in degrees Celsius will be taken by a Celsius thermometer.

Project Number: SBI002

Grade: 10

Title: Growing Beans

Abstract: The purpose of the experiment was to see which type of bean would grow the quickest in the different types of soils, and to see which type of soil is the best for growing beans. The procedures used were planting the half runner and blue lake beans in sand, mushroom, potting, top soil. The beans that grew the fastest were the beans in sand, but most of them died. The type of bean that is the best overall for fastest and longest was the Half Runner beans. The type of soil overall for best growing was potting soil, even though it took some time for the beans to come up. Therefore, the data show that the Half runner beans in potting soil grew the longest and quickest.

Project Number: SBI003

Grade: 9

Title: What is Banana Gas?

Abstract: The experiments purpose is to find how ethylene affects a banana's ripening process. Two sets of bananas were placed in sealed plastic bags. One set had ethylene and the other had none. For seven days the bananas' appearance were observed and recorded. An iodine solution was made; one-half banana from each set was placed in the iodine solution. The solution binds to starch but not to sugar, making the banana's face darker. Bananas with ethylene looked older; bananas without showed no signs of age. Ethylene ripens bananas faster than if bananas had no ethylene on them.

Project Number: SBI004

Grade: 10

Title: Glow With The Flow: Year Three

Abstract: How will altering the length and velocity of mechanical stimulation applied to *Pyrocystis fusiformis* and *Pyrocystis lunula* affect their chloroplast distribution and cell structure?

Project Number: SBI005

Grade: 12

Title: The Effects of Pollutants on Environment

Abstract: Please visit student's exhibit for the abstract.

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Project Number: SBI006 **Grade:** 9

Title: Anti-Algal Effects on TAML Catalysts

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI007 **Grade:** 9

Title: Methane Gas Production Experiment

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI008 **Grade:** 9

Title: Global Warming Affect on Beans

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI009 **Grade:** 10

Title: Can You Taste It?

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI010 **Grade:** 9

Title: Light Duration Influence on Elodea Circadian Rhythms

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI011 **Grade:** 10

Title: CO₂ vs O₂

Abstract: How does carbon dioxide blood levels compare to oxygen blood levels in female runners? Ten female runners of different abilities ran 10 minutes on a treadmill. Their CO₂, O₂ levels, and heart rates were measured before, half way through, and after ten minutes of running using a CO₂ monitor and pulse-oximeter. Analysis of data showed that in lower ability runners (2 to 2 ratio of breaths/stride) carbon dioxide levels increased but oxygen levels remained the same. For upper ability runners (3 to 1 ratio of breaths/stride) as the level of carbon dioxide decreased so did the level of oxygen.

Project Number: SBI012 **Grade:** 12

Title: Vitamin C Supplements: Natural vs. Synthetic

Abstract: The purpose of my experiment is to see if there is a difference in the effects of natural and synthetic vitamin C. To do this, groups of *C. elegans* will be cultured in a pre-made liquid medium with natural vitamin C added to one group, synthetic vitamin C added to another group, and no vitamin C to the third group as a control. A single *C. elegans* will be

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placed in each well of three separate spot plates. The number of eggs laid, number of offspring produced, and a time line of reproductive activity will be recorded for each group.

Project Number: SBI013

Grade: 11

Title: Where the Green Grass Grows

Abstract: This experiment finds if a nitrogen, phosphate, potash based or equal concentration fertilizer allows grass to grow the healthiest and fastest. A 'mini-greenhouse' is constructed. Fill cups halfway, six have a half- teaspoon of nitrogen based fertilizer, each fertilizer has six cups. Fill with dirt, place teaspoon of grass in each, cover with dirt. A cup with no fertilizer is control. Heights were 12.9 cm for equal concentration, phosphate 12.2 cm, potash 12.1 cm, nitrogen 10.3 cm, control 9.3 cm. Water everyday, keep under lights. Equal based fertilizer grew best grass, then phosphate, potash, nitrogen and control.

Project Number: SBI014

Grade: 10

Title: Does the type of food affect egg laying?

Abstract: The purpose of this experiment was to gather information about egg production for producer poultry. There were twenty-one Rhode Island Red chickens used and placed into pens with seven birds per group. Each group was fed a different feed: cracked corn, corn and soybean mixture, and a laying mash. The eggs were gathered and the number of eggs were recorded daily for a month. The chickens fed the laying mash laid the most eggs due to the minerals and vitamins in this feed.

Project Number: SBI015

Grade: 10

Title: Light Intensity and Plant Growth

Abstract: I tested two variables: the light bulb wattage, and regular versus energy efficient light bulbs. I used four different wattages of incandescent bulbs, and their florescent equivalents. In each of the eight light bulb groups, I planted 24 seeds of Wisconsin Fast Plants. Aside from the light bulbs, all factors were constant. I monitored the plants for 22 days for measurements and care. I collected data in the form of number of plants growing and average plant height, and found that there was little variation between different wattages, but a noticeable difference between florescent and incandescent light bulbs.

Project Number: SBI016

Grade: 9

Title: Calf Bottle Contamination

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI017

Grade: 9

Title: Hairy Lettuce

Abstract: In this experiment different increments of keratin were added to cups to determine if the keratin would affect the plants' growth in centimeters. The hypothesis of this experiment was that as the amount of keratin was increased the plant would grow better. The hypothesis was not supported by the data, the plants with hair in them did grow better but the amount of

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hair was not a factor. The materials for this experiment were twenty Styrofoam cups, lettuce seeds of any brand, at least 2 grams of undyed hair, a metric scale, ½ cups of peat moss for each cup, and a heat lamp. The results of this experiment showed that keratin does aid in the plants growth.

Project Number: SBI018

Grade: 9

Title: Inbreeding and Longevity in BMDs

Abstract: The purpose of this investigation was to find the relationship between inbreeding and the longevity of the Bernese Mountain Dog. The tabular method of inbreeding calculation was used to find inbreeding coefficients. The program R was used for statistical analysis. Based on 57,187 records from BernerGarde, of which 6,034 had longevity data, it was found that every 1% increase in inbreeding resulted in 10 less days of life. Further research shows trends of the longevity between years of birth and that females are expected to have a six month longer lifespan than males.

Project Number: SBI019

Grade: 11

Title: Oxidative Stress - Part 3

Abstract: The purpose of this experiment was to determine if genetic factors could affect the output of free radicals from the mitochondria in the ATP process.

Project Number: SBI020

Grade: 12

Title: Natural vs. Artificial Insecticide/Repellent

Abstract: Insecticides and repellents have been used for decades but with the repercussion of toxic run off and pollution. This project tested to see the efficiency of natural repellents/insecticides versus the leading artificial brand repellents/insecticides. The hypothesis predicted for the natural to be an overall better repellent. Purple hairy stem Wisconsin fast growers were grown and Cabbage butterflies' larvas introduced. Amount of leaves eaten, and height loss were recorded in millimeters and the larva weighed in grams. The project was performed in hopes to find that natural is more effective as a repellent but less as insecticide.

Project Number: SBI021

Grade: 9

Title: Do rocks effect plant growth?

Abstract: This experiment tested whether or not rocks in the soil effected cucumber growth. Four containers labeled A-D were filled with different amounts of rocks and soil. Container A was 100% soil, B was 25% rocks and 75% soil, C was filled with 50% soil and 50% rocks, and D was willed with 25% soil and 75% rocks. The plants were placed under a grow light 24/7 and the plants were watered as needed. I measured the plants every other day. The plants in container C and D started to grow the best. In the end, the plants in containers A and B grew the best

Project Number: SBI022

Grade: 10

Title: PCR Differentiation of Family Members

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Abstract: My family's bathtub is always clogged with hair. I would like to find out whose hair is responsible. Through the Polymerase Chain Reactions (PCR) amplification of family members DNA and the clogging hair DNA, I hope to find out whose hair is responsible for clogging our bathtub. My procedure includes collecting and isolating the DNA from the samples, performing PCR to amplify specific DNA segments, and performing and analyzing a gel electrophoresis to conclude the culprit. I concluded that everyone was responsible for the clogged bathtub because there were similarities from the mystery sample to all family member samples.

Project Number: SBI023

Grade: 11

Title: Does Rumen Bypass Choline Affect Weight Gain in Beef Cattle?

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI024

Grade: 11

Title: Cow Score vs. Milk Production

Abstract: The purpose of this experiment is to see if the score of a Holstein cow has any correlation to her milk production. The cows score and milk production from her 305 day record will be compared using graphs and mathematical calculations. From these mathematical calculations a line of regression will be created. This will show whether or not there is a correlation. A 72 point cow produced 7,930.16 kilograms and an 87 point cow produced 14,988.51 kilograms. There is a correlation between the cows score and the amount of milk that she produces.

Project Number: SBI025

Grade: 10

Title: Plant growth reacting with melatonin

Abstract: The project was chosen to find another way to help keep plants growing and an easy way to do it. Melatonin was the substance chosen because in plants it is to be found in small amounts. The project started off as 2 sets of grass growing naturally and then on December 26th the containers were divided into 4 and the melatonin was added. The first set was a controlled substance compared to 2,3,and 4 sets which were 1,5,and 10 melatonin tablet solutions. Weekly it was checked and the result was melatonin had no effect.

Project Number: SBI026

Grade: 10

Title: Genetics and Sudden Cardiac Death

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI027

Grade: 10

Title: Food for Thought - Mercury in Tuna

Abstract: Tuna samples will be refluxed with equal amounts of 6 M HCL (hydrochloric acid) in order to break tuna down into its chemical elements. Heating will denature the organic elements present including Hg+. After cooling, the solid tuna will be filtered before being

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mixed with an aqueous portion of 1 M of KOH solution. After drying, the solid portions will be weighed and the amount of mercury in each sample will be determined. The amount of mercury in each sample will be compared to EPA guidelines.

Project Number: SBI028

Grade: 9

Title: The Effect of Bread Type on the Growth of Mold

Abstract: The purpose of this experiment is to test if and how the type of bread affects the growth of mold. What this information indicates about the nutrition and preservative content of that bread will also be explored. The original hypothesis is that breads with low nutritional value and high preservative content will withstand mold growth the longest, while breads of greater nutritional value and lesser preservative content will mold more quickly.

Project Number: SBI029

Grade: 12

Title: Amphipods and Reliv

Abstract: I tested the nutritional supplement Reliv© on *Hyalloella* ssp. amphipods. I arranged two treatment groups of 5 units each containing 5 female amphipods. The treatments consisted of two different diets (.05 mL tetramin and alfalfa.05 mL tetramin and alfalfa mix and .05 mL of Reliv.) Half of each group was placed in an incubator and the other half placed in a dark, cabinet. Temperature in the incubator was started at 20°C and increased by 3°C every 24 hours over a 96 hour period. Data indicates Reliv had no positive effect on the Amphipods ability to tolerate heat stress.

Project Number: SBI030

Grade: 0

Title: The Effect of Artificial Snow on Plant Life

Abstract: The purpose of my experiment was to test if artificial snow harmed plant that came into contact with. Distilled water was used as a control and was compared to real and artificial snow. The pH of the water was measured every day to test the level of acid in each type of water. The data proved that since the artificial snow contains liquid nitrogen, an acid that causes rapid frostbite, the plants in contact with the artificial snow were harmed. The experiment concluded that artificial snow does harm plants it comes into contact with.

Project Number: SBI032

Grade: 9

Title: Do Stoma Affect Drought Resistance?

Abstract: Purpose of experiment: To see whether or not the number of stoma on a leaf affects the drought resistance of the plant. Procedure: 1. Plants ten seeds of each level five (weak in drought resistance) and level 8 (strong in drought resistance) corn seeds. Grow them under constant conditions- give the plants 50 mL of water every other day, equal amounts of soil, temperature between 20 to 25 degrees Celsius. Make sure plants get 15 hours of fluorescent / natural light. 2. Once leaves are fully grown, cut 10 leaves of each drought resistance level. Keep leaves separated by level. 3. Examine epidermal images under a microscope; count the number of stoma in two places- near the epidermis and the tip. Record all data in a table and compare the data. Conclusion: The more stoma, the less drought tolerant the plant is.

SENIOR DIVISION – BIOLOGY

Project Number: SBI033

Grade: 9

Title: Different Plants' Resistance to Car Exhaust

Abstract: This experiment follows upon an experiment done by Jason Weinman of Edgemont JR/SR High School. In that experiment, plants of two different types were killed when subjected to car exhaust. The purpose of this experiment is to determine which of ten different types of plants is able to grow despite being subjected to car exhaust.

Project Number: SBI034

Grade: 9

Title: Fake ID

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI035

Grade: 9

Title: The Shots that Count

Abstract: My science fair project is about the types of hockey shots there are and which one is the fastest and most accurate. I had three people shoot and calculated their speed and measured their accuracy by putting a target in the corner of the net.

Project Number: SBI036

Grade: 10

Title: Effects of Hoodia on Mealworms

Abstract: Hoodia's potential employment as a weight loss remedy could have a profound impact on our society. By conducting this experiment, I am looking to find whether mealworms fed apples supplemented with Hoodia gain less weight than mealworms fed with only plain apples. To conduct this experiment, I needed to set up a controlled environment, in which their food supply could be isolated and altered with the drug. I grouped the control group and the treated group separately. After two weeks, I had found that the mealworms treated with Hoodia gained less weight than the control collection.

Project Number: SBI037

Grade: 9

Title: What's the Porpoise?

Abstract: My project is to find out what is driving the Harbor Porpoise's movement throughout the sea. I think that their movement is being triggered by ocean temperatures. I will be testing my theory by examining satellite fixes, maps that will show where satellite fixes were made, charts showing ocean temperatures and finding the distances that the Harbor Porpoises traveled by using data tables. My results indicated that the Harbor Porpoises are moving more to follow their favored temperature range than to follow the warmer or colder weather specifically.

Project Number: SBI038

Grade: 9

Title: Microbial Survivorship In River Fertilizer Runoff

Abstract: Please visit student's exhibit for the abstract.

SENIOR DIVISION – BIOLOGY

Project Number: SBI039

Grade: 11

Title: The effects of pH on Germination of Glycine Max

Abstract: Glycine max requires many different factors to germinate and grow. pH is one of the most important. In this project Glycine max seeds were planted in soils, which had varying pH levels. The pH was obtained by adding aluminum sulfate to lower the pH and lime to raise the pH, (resulting in five different pH levels). Fifteen seeds were planted in each of the five containers and were watched for seven days. The results were that Glycine max seeds require a specific pH for germination and growth.

Project Number: SBI040

Grade: 11

Title: Got lactase?

Abstract: Problem: How does the glucose concentration in cow's milk and lactose-free milk change with time after lactase is added? Hypothesis (partially supported): The glucose in cow's milk will reach its highest peak five minutes after lactase is added and lactose-free milk will remain the same. Procedure: Lactase solution was added to cups of water, 2% milk, and 2% lactose-free milk. Glucose tests taken up to sixty minutes after lactase was added. Data: 2% milk gradually increased to 1/2% (500mg/dL); 2% lactose-free milk remained at 1% (1000mg/dL). Conclusion: It takes five minutes or less for lactase caplets to begin digesting lactose.

Project Number: SBI041

Grade: 9

Title: Resistance of Antibiotics

Abstract: The purpose of the experiment was to see the effects of antibiotics on staphylococcus aureus because many bacteria today are becoming resistant to antibiotics. The first step was to micropipette the bacteria onto the agar plate, and then spread it evenly over the plate. I then dispensed four identical antibiotic disks onto the agar plate. Repeat for each plate with a different antibiotic disk. After putting into the incubator for 24 hours, I measured the zones of inhibition. I did several trials to produce the results. The conclusion accepts my hypothesis because the bacteria were the most resistant to penicillin.

Project Number: SBI042

Grade: 11

Title: Utilizing Dynamic Gene

Abstract: Dynamic gene is a new web-based interactive database. The interactive database can be used to map genes within an identified genome. This is a powerful new scientific tool in the field of genetics research. My research project demonstrates how the data can be accessed in a use friendly manner, and presents various examples of research that can be conducted using the online database. This study represents the future of genetics research.

Project Number: SBI043

Grade: 11

Title: The True Effects of High Heels

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Abstract: High-heeled footwear, or high heels, is footwear that raises the heel of the wearer's foot significantly higher than the toes. Normally worn by women, high heels are commonly used to improve appearances by making wearers taller, with longer legs and thinner ankles. This experiment was designed to test the short term effects of high heels, specifically whether their legs become physically longer and/or if their ankles become thinner. Human subjects were measured with and without high heels on. Participants also completed a short survey to investigate possible corollaries between physical and mental effects.

Project Number: SBI044

Grade: 11

Title: Proliferative Study of Adipose-Derived Stem Cells

Abstract: Adult stem cells have enormous clinical applications. One type of adult stem cell, adipose-derived stem cells (ASCs), is very abundant in human adipose (fat) tissue. This study intended to determine which line of ASCs, superficial-abdominal fat stem cells or omental fat stem cells, is better for clinical application. A proliferative assay was conducted on both cell lines. It was determined that there was no statistically significant difference between the two lines' proliferative capacity, which leads me to accept my null hypothesis. Future work include assays for superficial-abdominal vs. omental stem cells studying differentiation capacity and apoptosis.

Project Number: SBI045

Grade: 9

Title: Salinity Influence on Algal Populations

Abstract: Purpose - to test the effects of salinity on algal survivorship/population growth. Procedure 1) Enclosed cardboard environment was created for the algae to grow, including light from an artificial plant light and temperature controller kept at 30 degrees Celsius 2) Euglena/Chlamydomonas + Soil Water, salt water, and spring water were pipetted into 13 x 100 borosilicate culture tubes with 3 replicates of each 3) The growth of both types of algae were monitored every other day for 2 weeks: absorbance at 430 nm in a spectrophotometer. The data showed that the algae grew better in the lower salinities

Project Number: SBI046

Grade: 10

Title: Do sugar substitutes affect the growth of yeast?

Abstract: The purpose of this experiment was to determine if sugar substitutes have an affect on yeasts' production of carbon dioxide foam. Controlled amounts of yeast, water, and sweeteners were added to the test tubes, which were then capped and gently shaken to mix. The height of the foam in the test tubes was recorded every five minutes, and each test lasted thirty minutes total. Five tests were performed. Corn syrup was the best on average followed by sucralose, honey, aspartame, and sugar, respectively. The hypothesis was that sugar would make the most foam, and the data did not support that hypothesis.

Project Number: SBI047

Grade: 11

Title: Oxidation Evaluation

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI049

Grade: 12

SENIOR DIVISION – BIOLOGY

Title: Fatty Acid Accumulation In Monocytes

Abstract: The purpose is to find the effects of trans fats on fatty acid accumulation in monocytes. The procedure is to expose nine flasks of monocytes to normal medium, soy oil, which has cis unsaturated fatty acids, and partially hydrogenated soy oil, which has trans fats. Wash and remove the cells and then perform a lipid extraction and gas chromatography-mass spectroscopy on each flask. The results show monocytes exposed to trans fats have a higher peak than those exposed to cis unsaturated fatty acid and normal medium, showing that cells exposed to trans fats accumulate more fatty acids.

Project Number: SBI050

Grade: 9

Title: Music Makes Me Lose Control

Abstract: I had fourteen willing participants listen to five genres of music: rock/heavy metal, hiphop/rap, classical, scary, and New Age. I had them listen to the music for five minutes, all the time monitoring their heart rate. I gave them a questionnaire, asking them to number the genres from favorite to least favorite. Their heart rate during the songs was compared with their resting heart rate and I saw if how much they like the genre affects their heart rate.

Project Number: SBI051

Grade: 11

Title: Quantification of Extent of Pasteurellosis Infection in Domestic Rabbit Herds

Abstract: It is currently thought that Pasteurellosis is endemic in the domestic rabbit industry. Currently established husbandry techniques are to destroy all rabbits which exhibit signs of Pasteurellosis. Foreign studies suggest Pasteurellosis may not be endemic. This study attempts to determine the extent of infection and suggest appropriate husbandry techniques.

Project Number: SBI052

Grade: 11

Title: Skeletal Muscle Specific Fast MHC Expresses in Developing Heart

Abstract: It has been widely accepted that terminally differentiated mature heart muscle does not express proteins that are specific to skeletal muscle. I have tested the hypothesis that skeletal muscle specific myosin heavy chain protein is expressed in developing immature heart muscle.

Project Number: SBI053

Grade: 12

Title: The Effect of Habitat on Beta Fish

Abstract: Betta fish are decorative tropical fish, but most live alone. This project will test the effect of habitat on betta fish. The hypothesis is that the fish will adapt the least to overcrowding. Behavioral patterns like aggression, swim patterns, and weight changes will be observed daily. There are two variables in this experiment, crowding due to decor or other fish. The overcrowded fish will likely adapt the least to their environment, and the control fish will adapt the best. (The less their environment changes, the better the fish will adapt.)

Project Number: SBI054

Grade: 9

SENIOR DIVISION – BIOLOGY

Title: Metabolic Enhancer Effect On Microbes

Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI055

Grade: 11

Title: Estrogen's Effects on TNF-Induced Cancer Apoptosis

Abstract: This research demonstrates that cell death in human breast cancer cell lines, caused by Tumor Necrosis Factor members (TNFs), is augmented by the estrogen receptor modulator Tamoxifen. Thus, the results represent the novel use of intrinsic, natural mechanisms of cell death by TNFs as an alternative to toxic chemotherapy. Cultured breast carcinoma (MCF-7) cell lines were exposed to TNFs with estrogen or Tamoxifen, and the intrinsic death mechanism apoptosis was followed by fluorescence labeling. The results showed that estradiol had no effect on TNF-induced apoptosis but Tamoxifen increased cell death by 1.5-fold, giving new insight into the cell biology of these pathways. Modulation of estrogen receptors, by Tamoxifen for example, represents a novel therapeutic modality in the control of breast cancer growth by natural TNF mechanisms.

Project Number: SBI056

Grade: 10

Title: Nitrosylation of a Key Enzyme in Inflammation and Cancer

Abstract: The purpose of my experiment was to regulate cPLA2alpha, which is a key enzyme that converts membrane phospholipids into arachidonic acid (linked to inflammation and cancer). First, human cancer cells (SG231 and A549) were infected with an adenovirus vector encoding iNOS (an enzyme producing nitric oxide). Immunoblotting was used to detect protein levels of cPLA and iNOS. S-nitrosylation of cPLA was determined by the biotin switch assay. Cells were analyzed to measure cPLA activity and arachidonic acid release. Nitrosylation (the process in which nitric oxide reacts with a particular amino acid in cPLA) increased cPLA activity and arachidonic acid release.

Project Number: SBI057

Grade: 9

Title: The Effect of pH Levels on Lipid Growth in Algae

Abstract: My interests in micro-biology and current oil crisis lead me to conduct this controlled experiment. I grew the algae in pH levels of 4.5, 7, and 8, and then extracted the lipids by using the cyclohexane and expeller press method. I put the solution through filter paper and funnel into a small test tube, and waited for the cyclohexane to evaporate. Based on this experiment, I concluded that the deviation from the optimal growing range of 7pH was the best condition for the growth of lipids. Future replication is needed and more sophisticated pressing and separating methods can be explored.

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Project Number: SCH001

Grade: 11

Title: Fruit & Ethylene: A ripe Idea

Abstract: My experiment will test and compare which type of packaging and conditions keep fruit the freshest and why.

Project Number: SCH002

Grade: 9

Title: The Effect of pH Elevation on Hydrogen Sulfide

Abstract: This experiment was intended to determine if odor and corrosion in waste water systems can be reduced. Twenty-five liters of waste water were divided into 5 groups with pH values of 3,5,raw, 9,and 11. These were altered using caustic soda and sulfuric acid. One bottle was taken from each group and measured for pH, hydrogen sulfide, and dissolved oxygen. This was repeated for 4 weeks using the other four bottles in each group. Over the one month period, the raw group had the highest hydrogen sulfide content. PH 3 and 11 both stopped most hydrogen sulfide production, but pH 3 is so acidic that it would corrode the pipe. This means that to reduce odor and corrosion, the water needs to be more basic.

Project Number: SCH003

Grade: 9

Title: Does Washing Reduce Effectiveness of Flame Retardant Fabric

Abstract: This project is to determine if a flame retardant application on fabric would last after the fabric is washed several times. Flame retardant fabrics would not only protect people from being burned, it would also slow the spread of fire. This project concentrates on the application of a liquid flame retardant (Flame Busters) to 100% cotton muslin material. Two sets of controls were made; one was untreated cotton muslin and one treated with no washing. The rest of the samples were separated into two (2) main groups; one for washing in regular Tide detergent and the other washed in Tide with bleach. All samples were burned and recorded to analyze if the washing did affect the flame retardancy. The conclusion is that yes washing does reduce the effectiveness of the flame retardant material.

Project Number: SCH004

Grade: 9

Title: What is the best way to make rice sticky?

Abstract: There are rumors that when the ancient Chinese were building the Great Wall of China, they used rice mixed with different additives as a rice mortar. My experiment is to find out which is the best way to make rice sticky. I prepared different rice mixtures, each containing rice with eggs, vinegar, cornstarch, flour, or wheat gluten. Using a spring scale, I tested the stickiness of the mixtures. I then applied an alternative search. I discovered 15 mL of flour and 45 mL of wheat gluten made the rice the stickiest. Future experimentation is to alternate the rice preparation process.

Project Number: SCH005

Grade: 11

Title: Temperature and Gas Purchase

Abstract: Please visit student's exhibit for the abstract.

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Project Number: SCH006

Grade: 9

Title: Shampoo Efficiency

Abstract: Purpose: Determine the efficiency of shampoos.

Procedures: In the dirt dispersion test, take test tubes add 8 grams of shampoo, add 10 mL of water, 1 drop of India ink, and used the shake technique to equally disperse the shampoo and water mixture, repeat 15 times for each shampoo, and for hard and soft water. For the percent solids test mass a crucible, add shampoo and mass again, and then place on a ring stand and heat with a Bunsen burner, after massing again place in a desiccator and mass every day for 2 days, repeat 15 times for each shampoo.

Project Number: SCH007

Grade: 11

Title: Baking Soda vs. Baking Powder

Abstract: Can baking powder be replaced with baking soda and cream of tartar in a baked good? The purpose of this experiment was to find out. By using a muffin recipe that called for baking powder, the baking powder was replaced with baking soda and cream of tartar of different measurements to find out. The mass and height of each muffin were recorded to see if baking powder could be replaced with baking soda. The results show that baking powder cannot be replaced with baking soda and cream of tartar because the acid level is different.

Project Number: SCH008

Grade: 9

Title: Reactions of nails to different types of water

Abstract: This experiment was designed to determine if different types of water had an effect on galvanized and uncoated nails. Galvanized and uncoated nails were placed in tap water, saltwater, and sugar water for five days. The amount of rust was measured each day using a comparison scale. It was determined that uncoated nails rusted more than galvanized nails in all solutions. Overall, tap water was determined to produce the most rust, while saltwater produced the least amount of rust.

Project Number: SCH009

Grade: 10

Title: H₂O₂ Hydrolysis of Triglycerides

Abstract: The experiment determines how hydrogen peroxide chemically affects one of the major components of plaque: triglyceride. The experiment compares the degree of hydrolysis that a control group and experimental groups with varying concentrations of hydrogen peroxide solutions cause the medium-chain triglyceride to undergo. The experiment demonstrates that the MCT Oil was NOT hydrolyzed by varying concentrations of H₂O₂. Future research could ascertain if hydrogen peroxide separates 1 of 2 fatty acids and leaves a mono- or diglyceride intact.

Project Number: SCH010

Grade: 11

Title: Insulation

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Abstract: In my experiment, I placed jars of hot water in different materials to see which materials kept the water warmer after 10 minutes. Materials included packing pellets, bubble wrap, newspaper, etc.

Project Number: SCH011

Grade: 11

Title: Do All Sweeteners Crystallize?

Abstract: My experiment was to see if sugar substitutes crystallize as well as sugar. The first thing I did was gather my materials. After I got everything I needed, I started the experiment. I boiled water and added my sugar, splenda, equal, and sweetener low, each at different times. Once each solution was heated and dissolved, I poured each one in a glass and let it sit with the string hanging down in the solution. A few days later I checked back and some changes had occurred. A few more days I checked back again, and I did this a few more times.

Project Number: SCH012

Grade: 10

Title: Effects of Cooking on Calories

Abstract: Please visit student's exhibit for the abstract.

Project Number: SCH013

Grade: 11

Title: Acetaminophen Analysis by LCMS

Abstract: Acetaminophen is a common over-the-counter drug used to reduce fevers and relieve pain. Most manufacturers claim 500 milligrams per tablet in their product. My experiment was designed to determine the amount of acetaminophen in various pain relievers using LC-MS, compare the amount to the active ingredients label, and calculate the cost efficiency. Based on my results, I found that most brands are within 10% of what the label states. The most cost efficient brand was found to be Wal-Mart. Although Tylenol is the most popular brand and has close to 500 milligrams of acetaminophen, it is not cost efficient.

Project Number: SCH014

Grade: 9

Title: Hair Dye

Abstract: Please visit student's exhibit for the abstract.

Project Number: SCH015

Grade: 10

Title: Celiac Disease's Distant Relatives

Abstract: The purpose of this experiment is to determine if there could be a relationship between Celiac Disease and Lactose Tolerance. The procedure determines if there is gluten present in the products buy using a monoclonal antibody. Bromelain is added to experimental group to ascertain if gluten is reduced. Gluten was found in 27% if the control group. The enzyme decreased the level of glutenin 50% of the experimental group that tested positive for gluten. Future research could be conducted by testing more samples, altering the amount of beomelain and pther preteases to achieve consistent reduction of gluten.

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Project Number: SCH016

Grade: 10

Title: Effect of Microstructure on Surface Wetting

Abstract: Lotus leaf's ability to stay clean inspires development of self-cleaning materials. For example, textiles that can shrug off water and food spills using micron sized bumps on the fibers. The lotus's self-cleaning effect is due to a combination of physical structure and surface chemistry. In this study the effect of the size of the pillar, spacing between pillars, and surface property of the pillars on surface wetting have been investigated using different size of hydrophobic and hydrophilic particles. Degree of hydrophobicity has been determined from droplet diameter measurements as well as conventional contact angle measurements. The results help to unfold the lotus effect from fundamental.

Project Number: SCH017

Grade: 10

Title: Vitamin C Content

Abstract: The title of my project is Vitamin C Content. The category is Chemistry and I'm in the 10th grade. The procedures I followed were to first make the indicator which contains cornstarch, iodine, and water. Then I tested four different types of vitamin c which were frozen, canned, bottled, and freshly squeezed. I dropped drops of the indicator into the juices one by one counting each drop. The concept was to change the indicator to a distilled color almost like there is no color. The frozen orange juice contained the most vitamin c and the Minute Maid canned orange juice contained the least.

Project Number: SCH018

Grade: 9

Title: The Effect of Plating on Steel's Resistance to Corrosion

Abstract: This experiment was intended to determine whether the plating of steel would prevent the corrosion of the steel. I obtained copper-plated, brass-plated, zinc-plated, and regular steel nails, and vinegar to use as my acid. Four vinegar groups had eight nails of one type of plated nail put in each. After the eighth day, I took the nails out of the vinegar and rinsed them off in tap water to remove any and all possible corrosion and compared the types of nails. The before and after differences of the experiment, and the average difference of each group, were found.

Project Number: SCH019

Grade: 10

Title: Medicated Popsicles: Finding Easy Ways to Take Medicine

Abstract: The experiment was to explore the feasibility of medicated popsicles for children. Different concentrations of liquid medication and sugar were mixed into water and frozen to determine their freezing points.

Project Number: SCH020

Grade: 11

Title: Utilizing Industrial Wastes

Abstract: This research is devoted to the treatment of pharmaceutical wastes that contain sodium methylate and sodium ethylate. Another component of this investigation is the purification of glycerol, the byproduct of biodiesel production. It was shown that an

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electrochemical cell equipped with a cation-exchange membrane can convert sodium methylate and sodium ethylate to sodium hydroxide and corresponding alcohols, whereas sodium glycerolate, the glycerol precursor in biofuel production, can be converted to glycerol without the addition of an acid. It has been concluded that electrochemical "neutralization" of sodium glycerolate to form glycerol is more beneficial than the "conventional" neutralization with an acid.

Project Number: SCH021

Grade: 10

Title: Brand vs. Generic: Which dissolves faster?

Abstract: The purpose of this experiment was to determine if the reaction time of pain relievers implied on television commercials actually occurred in the same manner. A series of trials were conducted heating equal amounts of water and vinegar in separately marked containers to equal temperatures that mocked average body temperature. The data collected were dissolving times of each generic and brand pain reliever in water and in vinegar. The predicted hypothesis was that generic aspirin would have the lowest dissolving time. It was concluded that generic brands dissolved quickest in both solutions.

Project Number: SCH022

Grade: 12

Title: Measuring Solubility in Household Chemicals

Abstract: The purpose of this experiment was to measure the solubility of household chemicals. The procedure began with dissolving the chemicals (table salt, Epsom salt, and sugar) in distilled water. The amounts of chemicals dissolved were calculated. The samples were then evaporated, and the weight of the remaining crystals was calculated. Amounts, weights, and calculations were all recorded in a data table, and will be presented.

Project Number: SCH023

Grade: 9

Title: Can You Erase Permanent Markers?

Abstract: Permanent markers are mostly permanent. There are proven ways of erasing them. None of those will be used in this experiment. The marker's ink contains three main ingredients: colorant Marker can be erased several hours after the application. WD-40, an anti-corrosion solvent, has proven to be the most effective substance for removing permanent markers. Rubbing and denatured alcohol have also proven to be very effective. Nail polish remover, which is used in erasing dry erase markers, is proven to remove permanent markers, as well. Sunscreen, shaving cream, and facial cleaning pads are also able to remove the ink. Even Tabasco sauce has been proven to remove the marker. When the marker is on the skin and nails, it can penetrate and enter the bloodstream. If markers are burned, the smoke may contain: carbon dioxide, carbon monoxide, amines, nitrogen oxides, and sulfur oxides. Markers are usually water resistant. All permanent markers are not supposed to be shake

Project Number: SCH024

Grade: 9

Title: Don't Rust Away

Abstract: The purpose of this experiment was to determine how to prevent damage from salt on automobile metal in the winter months. This was completed by putting automobile metal in different salt solutions used by PennDot. Preventative measures, such as paint and wax were then tested on

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the metals in the salt solutions. The data showed a difference in the rusting of the metals in the different salt solutions. As for the preventative measures, the exposed metals did have the most amount of oxidation.

Project Number: SCH025

Grade: 11

Title: Is It Hot In Here?

Abstract: I plan on making 4 control crystals of each Cupric Oxide and Silver Oxide while performing different methods of heat to extract the purest form of metal from that oxide. I will test using a density method. The First method consists of a fischer burner and the second will use a kiln.

Project Number: SCH026

Grade: 12

Title: Effect of Temp. On Decay of Ascorbic Acid

Abstract: Different processing can reduce or emphasize the amount of ascorbic acid (Vitamin C) present in nutrition sources. My project studies the effect of storing and cooking foods at different temperatures on the level of ascorbic acid (Vitamin C). I tested oranges, grapefruits, red peppers, and tomatoes stored and cooked at temperatures including: -17C, 20C, 68C, 177C. After neutralizing the acid present in each sample, an Ascorbic Acid strip was used to verify the levels of Vitamin C. I expect the data to indicate ascorbic acid (Vitamin C) values in strength as follows: oranges, red peppers, grapefruit, and tomatoes.

Project Number: SCH027

Grade: 11

Title: Determination of Mineral Concentration in Tap Water

Abstract: The mineral content in water varies depending upon the source of the water. In this project, I intend to test the overall mineral and metal concentration in different samples of tap water. Using EDTA, a ten pH base solution, and Erichrome Black T as the indicator, I will titrate two samples of tap water with deionized water as the control sample. This titration will indicate the total mineral concentration that can be found in different selections of tap water.

Project Number: SCH028

Grade: 9

Title: Tooth Sealants

Abstract: The purpose of this project is to determine which tooth sealant is able to with stand the acid effects of Orange Juice, Mountain Dew, and Water.

Project Number: SCH029

Grade: 10

Title: Bacteria : Helps/Prevents Rusting

Abstract: The purpose was to determine the effects of bacteria on rusting. I used sterilized jars to put the bacteria in. The different bacteria are organic soil, yeast, and yogurt. Put each bacteria and 100ml water into separate jars. Place non-coated nails into jars. Make observations over a week and record in a log book. Repeat steps. Find results and form

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conclusion. The results were that all nails did not rust except for control. There were some signs of rusting in the organic soil but the only change in all was the color of the nails.

Project Number: SCH030

Grade: 10

Title: Water Filtration and Fluoride

Abstract: The purpose of this experiment compared eco-friendly and non-eco-friendly methods of water filtration to find which method is best in regards to the removal of fluorine. This will be completed by first adding fluorine to distilled water, then filtering the water with 6 different filtration methods (evaporation, carbon filter, reverse osmosis filter, cord filter and coconut husks- 2 types). After filtering, a fluorine binding agent and a SPEC-20 were used to test the amount of fluorine remaining in the filtered water. The data showed that there was a difference in fluorine filtering efficiency between eco-friendly and non-eco-friendly filtering systems.

Project Number: SCH031

Grade: 10

Title: Increasing Fuel Cell Voltage

Abstract: The purpose of this experiment was to determine if the voltage of a fuel cell could be increased by changing the electrolyte, electrodes and the temperature of the electrolyte. Fuel cells are important as a source of renewable energy. The steps were:
1. An electrolyte was measured, mixed and poured into a beaker. 2. Electrodes were created from two wires. 3. Circuits were created with electrolytes, the electrodes, a battery and a voltmeter. 4. Electrolysis was conducted for one minute and the battery was removed from the circuit. 5. The fuel cell voltage was recorded. The conclusions were that 1. As temperature increased, the fuel cell voltage increased. 2. The KOH electrolyte with dissimilar electrodes created the greatest voltage. 3. Platinum electrodes produced the greatest voltage.

Project Number: SCH032

Grade: 10

Title: DEET's Effect on Fishing Line

Abstract: The purpose of this experiment was to determine if DEET has an effect on fishing line. 360 samples of fishing line were cut and loops were tied at their ends. Samples were then submerged in different concentrations of DEET solutions: 0% (control), 20%, 30% and 40%. The concentrations were based on common concentrations of DEET in insect repellents. Samples were tested at three different intervals by hanging them on a testing apparatus and adding weight gradually until they broke. The data collected showed that the samples submerged in greater concentrations of DEET were weaker than those submerged in weaker concentrations.

Project Number: SCH033

Grade: 9

Title: Electrophoresis

Abstract: The purpose of this experiment was to investigate which variables produce the best quality electrophoresis gels. To accomplish this experiment, agarose gels were made and run through electrophoresis with different variables such as varying voltages and different buffer solutions. When the gels were done and the fake dyes had reached their

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pre-determined spots, the time elapsed was recorded along with any defects and flaws in the gel and the electrophoresis process. The data showed that the variables did affect the quality of the electrophoresis process.

Project Number: SCH034

Grade: 9

Title: Latent Fingerprints

Abstract: Crime scenes shows information about police. Crime scenes have become very interesting Questions about how the police are able to define a criminal's fingerprint at the scene, and why at times fingerprints could not be lifted came about. This project tested prints left by hands dry and or lotioned to find which were best. The black powder brushed over and discovered the print. The results show that the lotion fingers were more visible. The hypothesis was supported by the data, concluding that the latent print would show up more affected.

Project Number: SCH035

Grade: 9

Title: Effect of Temperature on H₂O₂ Catalysis

Abstract: Temperature's effect on hydrogen peroxide's catalysis by the enzyme catalase, which I extracted from a potato, quickens the hydrogen peroxide (H₂O₂) decomposition, breaking into 2H₂O+O₂. I used a water bath for reaction temperature. I had a Catalase-soaked sponge immersed into a H₂O₂ solution where released oxygen would get trapped in the sponge fibers, and would cause buoyancy. The more oxygen, the faster the sponge would rise. My data was the time it took for the sponge to reach the surface of the H₂O₂ inside a test tube, and I concluded that 32 was the best.

Project Number: SCH036

Grade: 9

Title: Fruit Ripening

Abstract: Please visit student's exhibit for the abstract.

Project Number: SCH037

Grade: 12

Title: Which is More Effective in Finding a Latent Print Superglue or Powder?

Abstract: Please visit student's exhibit for the abstract.

Project Number: SCH038

Grade: 10

Title: Surface Treatments of Windshield Glass

Abstract: The project evaluated the performance and durability of different types of surface treatments for windshield glass to improve visibility, which included water repellent treatments and anti-fog treatments. The study showed that surface properties of windshield glass can be significantly changed by the surface treatments. Water repelling and anti-fog properties request different types of surface treatment. Water repellent treatments minimize the surface energy of the glass and creating a hydrophobic surface. Anti-fog treatments increase the surface energy of the glass and creating a hydrophilic surface. Durability of the surface

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treatment depends on the materials, properties, and surface preparations. Aquapel® and G-glass™ were the most durable water repellent treatments due to chemical bonding.

SENIOR DIVISION – COMPUTER SCIENCE/MATH

Project Number: SCM001

Grade: 11

Title: The Effects of magnetic Forces on Osmosis

Abstract: The purpose of the experiment was to determine the effect of magnetic forces on osmosis. An experiment was developed where osmosis occurred. It was tested with and without magnets. The results showed that the osmosis was not noticeably affected but there was a magnetic pull on the ions in the solution. In order to test whether the ions were affected, the time it took for the ions to pass through the membrane was tested. This was done using silver nitrate, which forms a precipitate when in contact with chloride ions.

Project Number: SCM002

Grade: 10

Title: Identifying Organelles in EM Images

Abstract: It is often difficult to visually identify organelles in EM images. Therefore, developing a classification program that uses Discrete Cosin Transform features in the classification of cellular structures in electron microscope images may be highly useful. Images were marked on a computer and different types of pixels were separated. The DCT was run on the sets of pixels and the resultant numbers were analyzed using a receiver operating characteristics curve. The lists of output numbers from the DCT were analyzed by programs. The DCT features were not useful in classifying nuclei pixels, but very useful in classifying mitochondria pixels.

Project Number: SCM003

Grade: 12

Title: Rhythm Gloves

Abstract: The purpose of the device is to use a Nintendo Wii remote's infrared camera to produce music via hand motions. By manipulating the infrared camera of the Nintendo Wii remote, it is possible to connect one's computer to the Wii remote via Bluetooth and return all the variables (rotation, button presses, etc). This includes the x and y coordinates of up to four infrared lights. Using the coordinates a Java program can be written to play specific MIDI tones depending on the y-value, and control the volume of said tone via the x-value. This allows for in-air musical production, via a glove which will emit infrared light from infrared LED lights on the tips of the fingers upon finger extension. At this point the program that will be used has been completed and the glove is being built and I will continue to work on adding more MIDI instruments to the program.

Project Number: SCM004

Grade: 9

Title: Voice Wave Analysis

Abstract: The purpose of this experiment was to try to identify people using their voiceprint.

Project Number: SCM005

Grade: 10

Title: Traversing a Maze Using Two Light Sensors

Abstract: This project investigated whether a LEGO Mindstorms NeXT Robot could navigate a maze using two light sensors. My hypothesis was that the robot could navigate the maze with 100% accuracy. The results were that the robot only achieved a 92% success rate on turns, although it was 100% accurate on straight paths.

SENIOR DIVISION – COMPUTER SCIENCE/MATH

Project Number: SCM006

Grade: 9

Title: Sudoku

Abstract: Please visit student's exhibit for the abstract.

Project Number: SCM007

Grade: 11

Title: Symmetric Encryption using AI

Abstract: This project concerned the creation of a new cryptographic method that, using artificial intelligence, proved to be highly effective against modern cryptanalysis. This cipher was made using the idea of a virtual "environment grid" for the AI to traverse and the idea of a public-private key system that enabled varying levels of security by giving the choice of revealing one key. The cipher was tested against cryptanalytic techniques, including Brute-force Attacks, Linear Cryptanalysis, and Differential Cryptanalysis. The cipher, with its flexibility in key usage and resilience to these attacks, proved to be stronger than known modern symmetric cryptosystems.

Project Number: SCM008

Grade: 12

Title: Erdos's Conjecture

Abstract: Erdos's Conjecture was first proposed in the paper "On the Prime Factors of $(2n + 1)$ " In it, Erdos conjectures that given any 3 primes there is an infinite number of n such that $(2n + 1)$ is indivisible by all 3 primes. We will prove this conjecture by exploiting the self-similar nature of the sequences of numbers indivisible by a given prime. We exploit the well-known fact that a prime p does not divide $(2n + 1)$ if every digit in the base- p expansion of n is less than $p/2$ to prove the conjecture.

Project Number: SCM009

Grade: 11

Title: Which sorting algorithm is the fastest?

Abstract: The purpose of this experiment was to find which sorting algorithm was the fastest. To accomplish this, four common sorting algorithms were used and tested to see which one could sort a set of randomly generated integers the fastest. The data used in this experiment concluded that the "merge sort" sorting method was the fastest, "insertion sort" was the second fastest, "selection sort" was the third fastest, and "bubble sort" was the slowest.

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Project Number: SES001

Grade: 11

Title: Ph Neutralizer

Abstract: The purpose of the experiment was to determine the difference in the neutralization-effectiveness of limestone gravel when contaminated water is heated-cooled, or at a neutral temperature. Neutralizing the pH of water is important to maintain a healthy environment. The procedure for the experiments started with the model diversion well, 4 liters of water, pH test-kit, eyedropper, Lemmon juice, hot plate/freezer, 2 liter bowl. Heat or cool the contaminated water to either 20-5-100 degrees Celsius. Pour the heated/cooled water through the model diversion well, and record findings. In conclusion, the temperature of the water did not effective the neutralization effectiveness.

Project Number: SES002

Grade: 12

Title: Level of P in Aquatic Systems

Abstract: Fertilizers contain both Nitrates and Phosphates, which can seep into the soil, and eventually run off into ponds or ground water. Elevated levels of these chemicals in water may eventually lead to erosion, the decline of water dwelling organisms, contaminated drinking water, and accelerated eutrophication. Concentrations of; 0.01, 0.03, 0.09, 0.15, 0.21 and 0.30 ppm phosphate were used in my experiment. Helisoma spp., Daphnia magna, and Dugesia tigrina were the organisms selected as models. Thus far results indicate higher levels of phosphate support better health of model organisms.

Project Number: SES003

Grade: 10

Title: How Durable are Biodegradable Forks

Abstract: Tested the strength, durability, and microwave ability of biodegradable utensils compared to conventional plastic untesils.

Project Number: SES004

Grade: 11

Title: Antifreeze Effects on Chlorella

Abstract: Please visit student's exhibit for the abstract.

Project Number: SES005

Grade: 12

Title: Identifying T Tauri Stars Using Small-Scale Optical Telescopes

Abstract: Identifying T Tauri stars can be a challenging process. It typically requires expensive and sophisticated equipment and data analysis techniques. This study used optical data from Kitt Peak National Observatory's WIYN 0.9-meter telescope and R, IR, H-alpha filters to image known T Tauri stars and standard stars. Simple intensity values were measured using MaxIm DL and plotted on an X/Y scatter plot with $\text{Log}(I\text{-intensity}/R\text{-intensity})$ vs. $\text{Log}(H\text{-alpha-intensity}/R\text{-intensity})$. There is strong evidence that this simplified data analysis technique termed SBOS could be used to identify and classify T-Tauri candidates.

Project Number: SES006

Grade: 12

SENIOR DIVISION – EARTH/SPACE/ENVIRONMENT

Title: Mini Solar Car

Abstract: the name of the project is mini solar car consist in move a mini solar car by a solar energy by two solar panels and two motors the body of this project is build with plastic glass is going to have four wheels and like solar light I am going to use the light of a lamp like a sun light and by radiants from the light and the solar panels I am going to produce energy and the solar panels are going to be connected by a wire to the motors and the motor to the wheels and just wait

Project Number: SES007

Grade: 10

Title: Does pH really make a dipHerance?

Abstract: The purpose of this experiment was to determine the effects of various pH on aquatic life. The testing took place in Herrington Creek and Murley Run in Garrett County. Murley Run empties into Herrington Creek which I predicted would be more acidic because there is less aquatic life in Murley Run and below the point where Murley Run enters Herrington Creek. I tested above the confluence in Murley Run and below the confluence. I searched for macro-invertebrates in all three sites and tested the pH. I found that my hypothesis was correct as pH does effect aquatic life.

Project Number: SES008

Grade: 11

Title: Greywater and Aquatic Systems

Abstract: This project was designed to test the effects of grey water on aquatic ecosystems including at what concentration grey water becomes harmful to a lentic ecosystem. The experiment tests how producers and consumers are affected. Forty ecosystems, divided into four treatments each having a different concentration of grey water, were set up. Each system contained algae as a producer and amphipods (*Hyalella* spp.) to serve as a consumer. Both the algae and the amphipods are quantified for results. Preliminary results are inconclusive up to this point.

Project Number: SES009

Grade: 10

Title: The Memory of Fish Mind Over Matter

Abstract: Please visit student's exhibit for the abstract.

Project Number: SES010

Grade: 11

Title: Potential Biological Inhibitors of Eutrophication

Abstract: Eutrophication is a major ecological issue within the waters of the Pennsylvania. Rainwater is leaching large amounts of nutrients from livestock pastures and agricultural fields into larger bodies of water, which causes severe ecological impacts. Within this experiment, 4 different plants were tested for their ability to absorb nitrogen, phosphorus, and potassium, and therefore their ability to act as inhibitors of eutrophication. To test this, the plants were transplanted into Pennsylvania soil, which was a uniform mixture of the O, A, and B soil horizons. Then a saturated, nutrient-rich water solution was watered onto each plant, to simulate runoff. For three days, the soil was tested for its nutrient content.

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Project Number: SES011

Grade: 10

Title: Can Aquatic Plants Remove Pollutants from Mine Water?

Abstract: Please visit student's exhibit for the abstract.

Project Number: SES012

Grade: 9

Title: Singing in the Acid Rain!

Abstract: The purpose of the experiment was to examine what earth material neutralizes acid rain. The procedure included the earth materials potting soil, soil, sand, and limestone, including a mixture. A solution of water and vinegar, modeling the acid rain, was poured into the cups containing the different earth materials. Wide range pH paper was used to test the pH to see which neutralized the acid rain. The pH level for the sand, potting soil, soil, and the mixture had no significant change however, the pH of the limestone sample neutralized to a level of 7. This data concludes that limestone was the only sample to successfully neutralize acid rain solution.

Project Number: SES013

Grade: 12

Title: The Acid Effect

Abstract: Please visit student's exhibit for the abstract.

Project Number: SES014

Grade: 11

Title: Solar Solutions

Abstract: Are solar panels effective enough to outweigh the price? Few solar panels have been implemented in the United States due to cost. I wanted to find out the difference of the amount of electricity generated in Pennsylvania compared to Florida, therefore, influencing how long it would take to pay off the system. I mathematically calculated that it would take approximately eighteen years in Pennsylvania and fifteen years in Florida to the point where the customer is obtaining their electricity for free. Therefore it was determined that factors need to change before people begin to start buying the system.

Project Number: SES015

Grade: 12

Title: The Affect of Fire on Soils and Plant Growth

Abstract: Heat can affect various mineral contents. This project tested to see if the change in mineral content on soil, caused by heat, would effect plant growth. The hypothesis was that the heated soil would enhance plant growth better than non-heated soil. This is because when some minerals are exposed to heat they increase. Four types of soil were tested (red clay, top soil, brown clay, potting soil) before and after exposing to heat. Wisconsin Fast growers were planted in each soil sample. The red clay is expected to have the best outcome because it already has a larger mineral content.

Project Number: SES016

Grade: 9

SENIOR DIVISION – EARTH/SPACE/ENVIRONMENT

Title: Legumes and Nitrogen Fixing Bacteria

Abstract: The purpose of this experiment was to find out how nitrogen-fixing bacteria affect legume plants and non-legume plants. The procedure for this experiment was to plant 20 pots of beans and 20 pots of grass seed. Nitrogen fixing bacteria was added to the soil of ten pots from each group and the effects were observed. Observations were taken once a week for three weeks. The data was placed into a data table and analyzed to see which group was affected the most by nitrogen-fixing bacteria when compared to the control.

Project Number: SES017

Grade: 9

Title: Effect of Telephone Pole Preservatives on the Heart Rate of Daphnia

Abstract: The purpose was to determine if the preservative in a telephone pole will negatively affect the heart rate of daphnia. I hypothesized as the amount of preservative in the water increases the heart rate will increase. I put 100g of telephone wood chips in 2L of water and laced a daphnia in for 5 minutes, then counted the heart rate under a microscope. I took 50ml samples over 14 days for the tests. The data partly supported my hypothesis the heart rate did increase but then dropped.

Project Number: SES018

Grade: 10

Title: Does Global Warming Exist?

Abstract: The purpose of this experiment is to see weather or not global warming exists. The procedure will be done with 16 containers which are the same. The first 8 will be filled with carbon dioxide from dry ice subliming the other 8 will just remain filled with regular air. Next each container will be heated individually, and temperatures for every 5 seconds will be recorded. Afterwards, all of the carbon dioxide temperatures will be averaged and the same with the air filled. Then two graphs will be made one for the air and the other for the carbon dioxide.

Project Number: SES019

Grade: 12

Title: How Does The Marigold Grow

Abstract: Please visit student's exhibit for the abstract.

Project Number: SES020

Grade: 10

Title: A Comparison of Areas of Differing Skyglow

Abstract: The purpose of this experiment is to compare the skyglow (light pollution) of urban, suburban, and rural areas. Procedure: First, the camera's dynamic range will be measured. Next, pictures of nighttime skyglow in various locations will be taken. After that, the photographs will be downloaded onto a computer. Using an image processing program, the average pixel gray intensity of each photo will be measured. Then, the pixel gray levels of photos of select locations will be compared, using graphs. The data shows that the urban area had the most amount of skyglow, with suburban next and rural last.

Project Number: SES021

Grade: 10

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Title: Can Organic Fertilizer Grow Plants Faster than Chemical Fertilizer?

Abstract: Please visit student's exhibit for the abstract.

Project Number: SES022

Grade: 10

Title: Factors Affecting Solar Cells

Abstract: The purpose of this investigation was to see at which temperature a solar cell put out the most electricity. After gathering all materials, I setup my apparatus. Each solar cell was tested using artificial sunlight from a halogen lamp. Each solar cell was under the light until stable, I then recorded the voltage and amperage levels. I calculated the wattage. Average volt and amp levels: Cell 1 .284V and 5.15A, Cell 2 1.19V and 5.01A, Cell 3 1.165V and 4.89A, Cell 4 .271V and 5.09A, and cell 5 1.370V and 5.01A. A cool temperature had the most output

Project Number: SES023

Grade: 9

Title: The Effect of Acid Rain on Plants

Abstract: The purpose for my project is to find out the effectiveness of buffers in neutralizing the effects of acid rain on plants and how the buffers themselves affect the plants. Buffers were added to the soil in which the plants were growing in. The plants used in this experiment and measured by their color, height, flowering, root mass, pH of the soil, and number of seeds produced to observe these effects. At the end of the experiment, the plants growing in soil containing sodium phosphate appeared to grow taller, be greener, and grow more flowers.

Project Number: SES024

Grade: 9

Title: Water Water Everywhere

Abstract: Please visit student's exhibit for the abstract.

Project Number: SES025

Grade: 11

Title: The effect of detergents on petroleum damaged bird feathers

Abstract: This experiment determines the best detergent in everyday life that is the most efficient in removing petroleum from feathers. Dish detergent was hypothesized to be the most efficient. Four detergents are used: lab detergent, hand soap, dish detergent, and body wash. Two controls were set up: clean bird feather and bird feather with maximum amount of petroleum applied. The clean feathers are massed then applied with petroleum jelly and massed. Afterward, the feathers were washed 6 times. The feathers were dried and massed again. Body wash was the most efficient, removing on average 95% of petroleum jelly. Hypothesis was rejected.

Project Number: SES026

Grade: 9

Title: Deicing Agents' Effects

Abstract: Please visit student's exhibit for the abstract.

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Project Number: SES027

Grade: 9

Title: Effects of Compost Material on Various Degradable Bags

Abstract: Please visit student's exhibit for the abstract.

Project Number: SES028

Grade: 11

Title: Using E. coli as a Biosensor

Abstract: assessed the efficiency of E. coli as a biosensor to test for heavy metal pollutants. I inoculated Luria broth mixed with solutions of Zn(NO₃)₂ or Cr(NO₃)₃ in .1M or .01M concentrations. The total change in percent turbidity, or relative amount of growth as measured by a spectrophotometer, was 7.5, 1.3, 0.53, 0.033, and 0.27 for the 0.01M Cr(NO₃)₃, 0.01M Cr(NO₃)₃, 0.01M Zn(NO₃)₂, 0.1M Zn(NO₃)₂, and the distilled water control. Based on this data, I conclude that E. coli is not an efficient biosensor for the detection of Zn²⁺ or Cr³⁺ in concentrations of 0.1M or 0.01M.

Project Number: SES029

Grade: 12

Title: Stream Patterns as a Function of Slope

Abstract: The purpose of this experiment was to see if a change in slope does change the sinuosity and meandering of a stream. Flow velocity of a stream is related to the slope channel. The steeper the slope, the faster the flow (3). Water that's running at a higher velocity adds turbulence, causing a turbulent flow with no parallel paths being formed (4). To conclude this project, a minor change in slope steepness does affect the sinuosity and meandering of streams, just by a simple comparison of two slopes.

Project Number: SES030

Grade: 9

Title: Does Estrogen Affect Escherichia Coli Survivorship?

Abstract: Please visit student's exhibit for the abstract.

Project Number: SES031

Grade: 9

Title: Just Keep Swimming

Abstract: Please visit student's exhibit for the abstract.

Project Number: SES032

Grade: 11

Title: Effects of Acid Mine Drainage

Abstract: Collect three water samples at three different locations on Bull Creek. Collect samples every two weeks so that three sets of data are able to be collected. Run the necessary tests to determine water quality. These tests include of testing for dissolved oxygen, temperature, conductivity, total dissolved solids, pH, hardness of the water, alkalinity, the amount of Iron and Manganese, the acidity of the water, sulfate, and turbidity. Each of

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these procedures is done according to Standard Methods for the Examination of Water and Wastewater. Also, leaf bags are placed in the creek at each location in order to observe the effect acid mine drainage has on macroinvertebrates. Average the numbers and make conclusions.

Project Number: SES033

Grade: 12

Title: Power of Pond Scum

Abstract: The purpose of my experiment was to determine whether or not algae can be used as a practical source for biodiesel. I made and grew the algae in a closed system providing all the proper nutrients. Then I measured how much algae was yielded. I extracted the oil from the algae and used it to make biodiesel by mixing it with the proper concentrations and volume of sodium hydroxide and methanol. The amount of biodiesel yielded was compared to growth duration and cost of chemicals to determine practicality.

Project Number: SES034

Grade: 9

Title: Acid Rain: Is it really that bad?

Abstract: The purpose of this experiment is to simulate an environment effected by acid rain. From the month of October, 2008, I am going to make a weather plan showing when it rained and when it did not in Pittsburgh, PA. To measure the effects of acid rain, I am going to use snail shells. I am going to do this by measuring the mass of the shells before and after the weather plan to determine if they were effected in any way.

Project Number: SES035

Grade: 12

Title: Electricity from Water

Abstract: This experiment was designed to test the possibility that a buoy can be constructed with the purpose of using the power of waves to produce electricity. This experiment will be tested by building a buoy with a small generator inside then water will be run through the apparatus allowing the generator to work. This was done in an attempt to find a more effective and less harmful form of energy that is less dependent on crude oil. In conducting this test it was found that it is possible to generate electricity using wave power.

Project Number: SES036

Grade: 9

Title: Tracking Geomagnetic Storms

Abstract: Please visit student's exhibit for the abstract.

Project Number: SES037

Grade: 12

Title: Herbicides in a Marine Ecosystem

Abstract: The purpose of this project was to test how a marine ecosystem in the "far from land" ocean would react to a low and possible concentration of herbicides in the water. Brine shrimp *Artemia* spp 500ml units of artificial sea water were set up and concentrations of the herbicides were added (.007ppb Glyphosate and .001ppb 2, 4-D). An equal amount of food to each experimental unit. Each trial was run for 96 hours. The data showed that there was

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virtually no difference in the size or the number of brine shrimp between each of the experimental units.

Project Number: SES038

Grade: 10

Title: Perfecting the Steps in Making Bio-Diesel

Abstract: The purpose of this experiment is to determine which method of removing water from used vegetable oil is most effective. Three different methods of water removal were tested for efficiency. The first method heated the oil to 100°C to evaporate the water. Another method was separation by heating and cooling the water, then removing the top layer of water. The third method consisted of a special filter designed to remove only water. Amounts of oil and water were kept as controlled variables. The result in the experiment did show differences in the three water removal methods for bio-diesel.

Project Number: SES039

Grade: 11

Title: Pittsburgh Pollution

Abstract: This project was created to answer which area river contained the highest Nitrate level. The hypothesis was the Youghiogheny river would contain the least nitrates since it takes a less-developed path, while the Ohio should contain the most nitrates because all the rivers empty into it. The problem was solved by attaining sample from each of the four rivers tested (the Youghiogheny, Allegheny, Ohio, and Monongahela) and testing with an aquarium Nitrate test kit. The results were similar, all 5 ppm (parts per million) or lower.

Project Number: SES040

Grade: 12

Title: Lawn Care and Soil Microbes

Abstract: Soil microbes are a major part of the terrestrial ecosystem. The key role of these microbes is to decompose organic materials. This decomposition releases N and P, which plants use to grow. Anything inhibiting those microbes, would have a major impact on the soil ecosystem. Herbicides kill plants, but do they impact the soil microbes as well? Schultz weed Killer (Glyphosate) was applied to soil samples to determine if it affected soil bacteria. Thus far, my results show that soil microbes are not affected by this chemical.

Project Number: SES041

Grade: 12

Title: Investigating Star Formation in LDN 981

Abstract: Lynds Dark Nebulae 981 is thought to be one of a few limited cases of isolated star formation. Since star formation is usually triggered by supernovae, strong stellar winds or colliding nebulae, isolated star formation is relatively rare. Using observations from the 2MASS Survey, the Spitzer Space Telescope, the WIYN 0.9 Meter telescope, and the 14 Inch Tzec Maun Telescope, an in depth study of star formation in LDN 981 was conducted. Data reduction was completed using MOPEX, Maxim DL, and Microsoft Excel. The results indicate additional star formation may be taking place within LDN 981, however it remains somewhat limited.

Project Number: SES042

Grade: 12

SENIOR DIVISION – EARTH/SPACE/ENVIRONMENT

Title: The Inconvenient Fact

Abstract: The ideas and perceptions of global warming are strong and vary greatly. My project will be to look at evidence and trends and to determine that global warming is a myth. It may be against common perception, but through information I have gained I do feel that I have proof against it. I used the information I gained and looked at various trends through graphs and diagrams that would support my hypothesis. From all the data collected, I have been able to prove my hypothesis. The value of this well overlooked information is priceless.

Project Number: SES043

Grade: 12

Title: Ca Buffering PO4 Pollution

Abstract: This project is the demonstration of Calcium Carbonate in controlling Phosphorous pollution. The objective was to determine the effect of Calcium Carbonate on the amount of Phosphorous found in the run-off and the growth of Chlorella algae. My variant groups consisted of no additional lime, 4.28g, and 8.56g. Beneath each apparatus was 200ml of Chlorella and de-ionized water, containing approximately 15.6 milligrams of algae. I poured 100ml of KH₂PO₄ solution, 40 ppm Phosphorous, overtop each soil apparatus. My phosphate test showed increasing Calcium reduced the phosphorous level. The gravimetric mass test showed that the enhancement of Calcium reduced algae growth.

Project Number: SES044

Grade: 12

Title: The Creation of Precious Gemstones

Abstract: In recent years the demand for precious gemstones has increased dramatically. This project was designed to show that most of the worlds gemstones can be easily and efficiently produced in lab at a much lower cost than finding them in nature. Producing precious gems in lab removes the environmental effects of excavating large quantities of earth to find them. In this experiment Fluorite and Rhodochrosite were two of the gems produced. Research will continue until most varieties of precious gemstones are produced efficiently.

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Project Number: SER001

Grade: 9

Title: Methods of Producing Electricity

Abstract: Please visit student's exhibit for the abstract.

Project Number: SER002

Grade: 11

Title: Traffic Jams: Fluidity vs. Chaos

Abstract: The traffic flow theory is a broad scope of equations that describe different aspects of traffic flow operation. This experiment used the macroscopic approach, with the queuing theory and fundamental design to simulate one-direction traffic flow on a roadway with a stop light. Data was analyzed to determine the "breaking point" for reaching traffic jam.

Project Number: SER003

Grade: 9

Title: The Labyrinth Challenge

Abstract: This project tests whether or not it is beneficial to control a rescue robot by remote control or to program it to be autonomous. The robot was first programmed to be totally autonomous and to navigate through a maze. Next I implemented the remote control mode and drove the robot through the same maze. My constants were: Programmer, Programming Language, and the robot hardware (NXT). I tested three characteristics. Characteristic one is completion of the task. Characteristic two determines accuracy in task performance. Characteristic three documents the time to complete the task. My conclusion is autonomous robots are more efficient.

Project Number: SER004

Grade: 9

Title: A New Spin on an Old Idea

Abstract: Purpose of the experiment: To test the efficiency of the different wind powered windmills. The common design seen around the country vs. my design. Procedures used: My design had 8 blades. I tested two common propellers bought from a model shop. One propeller has 2 blades, the other 3. I used K'nex to support the propellers while they were being tested. The propellers turned an electric motor and I measured the voltage. Data: The common two propellers generated only 10 to 20 mv, while my design generated 260 mv Conclusions: The common design of wind power is not very efficient.

Project Number: SER005

Grade: 10

Title: Thermal Effects on Op-Amps

Abstract: This project deals with various environmental factors that affect the performance of operational amplifiers. A selection of off the shelf amplifiers was compared to find the temperature range at which the amplifiers were most consistent and accurate. The amplifiers were performance-tested multiple times in hot, cold, and normal room temperatures with different gains. Data collected demonstrated maximum accuracy and precision in the median of each amplifier's suggested temperature range, supporting the original hypothesis. Understanding the effects of extreme conditions on performance could be valuable in improving circuit design.

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Project Number: SER006

Grade: 11

Title: The Best Sound Insulation

Abstract: The purpose of this experiment was to determine if household materials could be used as sound insulators. The hypothesis tested which household materials blocked the most sound. A testing box was constructed to hold the testing materials. A sound source played six different frequencies. A decibel meter measured the sound emitted from the box. The results did not support the hypothesis because the fibrous insulation had the best properties. There was not one material that was consistently effective for all sound frequencies. Overall, the results were not conclusive that one material is the best insulator for sound.

Project Number: SER007

Grade: 9

Title: Rocket Stability and Altitude versus Fin placement

Abstract: The purpose of the experiment was to find how stable the rocket was as the fins of the rocket were moved up on the body tube. There were five rockets built, each had fins placed higher on the body tube than the last. Each rocket was launched three times each. The data for altitude, distance from launch pad and visual stability were recorded. In the end, the rocket with the fins placed two inches up on the body tube was the least stable. Also, as the fins were moved up the stability got increasingly worse proving my hypothesis correct.

Project Number: SER008

Grade: 12

Title: Wind Energy in Cars

Abstract: In recent years pollution has become a major problem in the world. Wind energy is a much underestimated energy source and up to its full potential should be able to run certain components on a car making batteries last longer and eventually replacing them all together. This project was designed to determine whether or not wind energy could be efficiently used in cars to cut down on the pollution from them. A small wind generator was built and mounted on a car. The wind speed was then monitored using an anemometer and the electricity was monitored using a multimeter.

Project Number: SER009

Grade: 10

Title: Acoustics in Architectural Structures

Abstract: "How does architecture influence acoustics in a classroom?" To address this problem, sound recording equipment, an amplifier, and an iPod were used to record sound levels in 28 different areas of a science classroom. The distances between the amplifier and the areas were also recorded. After recordings of the sound waves and their decibels were taken, the data was analyzed to determine any correlations between the distance from the amplifier to the classroom areas and the sound levels at those areas. The data showed that there was a slight correlation but several anomalies were found throughout the classroom.

Project Number: SER010

Grade: 9

Title: Globe Motor Torque

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Abstract: The purpose was to test the machine with the globe motor on it until failure. This was done to find the torque of the globe motor. After building the machine, a bucket of sand was placed on the end of the arm. The amount of sand was increased until the failure of the arm. In addition, the amount of torque needed to lift the different intervals of weight was calculated. In the end, the globe motor's torque was 178-116 inch-pounds. In conclusion, the hypothesis was rejected. The prediction was that the motor would lift fifty to fifty-five pounds and it lifted forty-six pounds.

Project Number: SER011

Grade: 11

Title: Kayaks; What a Drag!

Abstract: The experiment determines if hull shape and length of kayaks would alter their hydrodynamicity. The hypothesis was that a longer and narrower kayak would have less drag but higher instability. Four kayak models were made out of clay and each was attached to a spring scale and weighed. When placed under a running faucet an average was taken from the changes and the final weight was subtracted from the original. The results showed the longer the kayak the more instable and the less drag it had. The independent variables were hull length and shape. The dependent variable was the drag.

Project Number: SER012

Grade: 9

Title: Riding on Air

Abstract: My science fair project will be testing what effect a hovercraft's air vents has on the weight it can support. I will build two hovercrafts with different air vent patterns and test both of them to see how much weight they can transport over a certain area. One hovercraft will have one big air vent, and the other one will have six small air vents. I will use a one horse power leaf blower to power the hover crafts. I am going to add standard eight inch thirty-five pound cement blocks or 5 pound books for weights. They will both have the same deck made out of plywood. One will have a bicycle inner tube to create the air pocket and the other hovercraft will have a plastic skirt for an air pocket.

Project Number: SER013

Grade: 9

Title: Go Green - Use LED

Abstract: Reducing the consumption of energy is an important issue across the US at this time. I conducted an experiment to find out how much energy savings could be obtained by using LED lights instead of incandescent lights in traffic lights. I built two electrical circuits and tested red, green, and amber LED and Incandescent lights. After calculating their relative wall plug efficiencies (RWE), I discovered that red LED lights have the highest RWE. From the data I collected, I also learned that, by replacing all the incandescent lights with LED's, a city can reduce their energy consumption by 35 percent.

Project Number: SER014

Grade: 11

Title: Searching for Signal

Abstract: In the experiment searching for signal the purpose was to try and increase satellite signal strength when weather is unfair. The goal was to build a unit out of heating coils to act as a defroster for a satellite dish. The hypothesis was that when the heating unit is in use during bad weather it should increase signal strength because snow that would normally disrupt the signal as it lays on the dish would be melting away; thus, increasing strength. In

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the end, the heating element was hundred percent effective in increasing signal strength in bad weather.

Project Number: SER015

Grade: 9

Title: Horns - Dare to Use Air

Abstract: I plan to make an air horn that will be loud enough to alert swerving drunk drivers or deer and other animals that could cause serious injury and to do this as inexpensively as possible. I know the store bought horn will look nicer than my homemade horn, but I believe the homemade horn will be the loudest. I will achieve this goal by using basic materials that I can find around the farm, such as PVC pipe, fittings and metal for a diaphragm.

Project Number: SER016

Grade: 12

Title: Salvaging Wasted Kinetic Energy from an Automotive Vehicle

Abstract: An engine will be built that is composed of primarily magnets with no inputs other than the base vibration energy. The engine will be a cylindrical shape that has a complete null field in the center, which will cause the inner rotor to lie stationary at the automobile's rest. The inner rotor will be a magnet. When the automobile begins moving it will vibrate, which will cause the null field to be disrupted, which will in turn cause the inner rotor to begin rotating, thus extracting energy from the vibrations, generating electricity.

Project Number: SER017

Grade: 9

Title: Fuel Efficiency

Abstract: My interest in alternative fuels and fuel efficiency led me to investigate which fuel would burn the most effective. Since higher octane fuels burns slower, they should burn colder, which in turn, should cause higher-octane fuels to produce a better gas mileage. Some of the fuels which I tested include E85, octane booster, n-butanol, biodiesel (which I made), methanol, a mix of methanol and E85, and my control, 87 octane gasoline. In conclusion, my results will provide information which will help consumers to understand what some of the effects of higher octane fuels are.

Project Number: SER018

Grade: 11

Title: Wing Shape vs. Lift of Airfoils

Abstract: The purpose of this investigation is to determine which airfoil design will generate the most lift and how weight affects that ability. Six aircrafts were constructed out of balsa wood and a wind tunnel was made to test for lift. A one speed motor was used for the air flow. Each aircraft was tested alone and with the addition of 1-10 grams. Overall, it was the rectangular airfoil that generated the most lift because it had the second greatest surface area, which was one factor, and its shape provided the strongest and most stable platform for the mass.

Project Number: SER019

Grade: 9

Title: Whisker Growth for Cooling System

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Abstract: Please visit student's exhibit for the abstract.

Project Number: SER020

Grade: 12

Title: The Effect Of Truss Designs On The Structural Efficiency of a Tower

Abstract: Various truss designs support a high amount of weight while using as little amount of material as possible. The purpose of this experiment is to determine which truss design, a Pratt truss, lattice truss, Warrant truss, or Vierendrel truss, has the highest structural efficiency compared to a control truss. It was hypothesized that the Vierendrel truss design would have the highest structural efficiency. The truss designs will be tested by dividing the amount of weight held by the structure's weight. The Vierendrel truss design's vertical members should eliminate tension, resulting in more weight held while still using little material.

Project Number: SER021

Grade: 9

Title: Concrete: Glass or Aggregate?

Abstract: Glass was tested as a substitute for aggregate in concrete in an attempt to put recycled auto glass to good use. I hypothesized that glass would allow the concrete to withstand a compressive force equal to or beyond that of the normal concrete aggregate. After testing, it was determined that the cylinder prepared with glass withstood much less force than the control.

Project Number: SER022

Grade: 12

Title: Pressure that Releases Stress

Abstract: I hope to make a practical leg massager constructed out of inner tubs, cloth, valves, and P.V.C. pipe. Air flow will be controlled by valves which connect to a P.L.C. Bread Board. Pressure and inflation will be controllable for different needs. I suspect that a smaller inner tube will give a better massage than a larger one because it works on a smaller area. The tests will run for a week each for about 15 minutes a day. The results will be subjective depending upon the patient's preference.

Project Number: SER023

Grade: 10

Title: Biodiesel vs. Diesel

Abstract: Please visit student's exhibit for the abstract.

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Project Number: SMH001

Grade: 10

Title: The effect of Shampoos on Hair Strength

Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH002

Grade: 9

Title: Should I or Shouldn't I?

Abstract: The purpose of my project is to show the harmful amount of bacteria that could be found on fruits and vegetables; it would also so show which produce is safer to consume without washing, when bought from a store or farm. My hypothesis was produce that is purchased from a store will have more bacteria on their surface, opposed to farm bought. First I purchased five fruits and five vegetables from each source. Next I swabbed each surface, transferred the swabbings to Petri dishes. Last I observed growth of the bacteria. I concluded that store bought produce is safer to consume.

Project Number: SMH003

Grade: 11

Title: Effects of Phone Radiation

Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH004

Grade: 11

Title: Is Green More Clean?

Abstract: My project is about the difference in efficacy in three different types of liquid hand soaps and hand sanitizers: organic, ones that contain alcohol, and ones that contain triclosan, a potentially hazardous chemical that could potentially cause cancer.

Project Number: SMH005

Grade: 9

Title: The Effect of Herbs on Bacteria

Abstract: The purpose of my experiment was to find out whether herbs had any effect on bacteria, and if so which one prevented bacterial growth the best. I used a centrifuge to mix turmeric, neem, and holy basil with water into solutions. I reserved Petri dishes for each herb. I split the dishes into six sections. Each day for six days I spread solution onto one section of each plate, and then scraped bacteria from my nostril onto it. Bacteria still grew in all the dishes, but it definitely grew less in dishes with solutions than my positive control. In the end, tulasi(holy basil) solutions prevented bacterial growth the best.

Project Number: SMH006

Grade: 10

Title: Effect of Glucose on Cancer Proliferation and Drug Sensitivity

Abstract: Glucose has been long been referred to as the sweet tooth of cancer, and in accordance the purpose of this project was to investigate glucose influence on prostate cancer (PC3-MM2) proliferation and glucose deprivation's effects on drug treatments particularly Adriamycin, a chemotherapeutic prototype, and on growth factor influences as well. Results

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suggest that cancer death rate significantly increases with decreased glucose concentration and that Transforming Growth Factor did not have a protective effect on the tumor cells by negating any therapeutical drug effects. Such decrease in glucose facilitates higher apoptotic deaths by increased sensitivity to chemotherapeutic agents.

Project Number: SMH007

Grade: 9

Title: Scaffold Degradation Product Effect on Myoblastic Stem Cells

Abstract: My objective is to investigate the effect of a collagen scaffold degradation products on murine myoblastic stem cell line C2C12. My procedure involved adding concentrations of scaffold breakdown products to cultured C2C12 cell flasks with a control, neutralized pH solution, being tested. After two days, cell toxicity/proliferation and differentiation effects were assessed using a hemocytometer and cell photomicrographs, correspondingly. The two treatment groups (with 1.0 mL and 0.1 mL of degradation solution) and control averaged 264,722, 398,611, 81,388 cells/mL, respectively. The differentiation photographs showed no significant effects. I conclude that scaffold degradation materials have no toxic effect at these concentrations.

Project Number: SMH008

Grade: 9

Title: Eye Color vs. Peripheral Vision

Abstract: My purpose of this project is to see if different eye color affects your peripheral vision. My hypothesis is that if you have dark eye color, then you will have better peripheral vision than someone with lighter eye color.

Project Number: SMH009

Grade: 12

Title: Effect of AgNO₃ on Ant-Bact. Tendencies of Paint

Abstract: Silver nanoparticles are suggested as a natural agent, compared to harsh chemicals, in preventing bacterial growth. This project tests the hypothesis that when added to paint, silver nitrate will prevent E.coli growth on paint-coated surfaces. Glass slides, painted then exposed to bacteria, were rinsed after 24 hours. The broth collected was incubated to indicate the presence of bacteria. The paint with silver nitrate added should allow the least amount of bacteria growth in this order: oil-based paint, acrylic paint, aluminum paint, and water-based paint. These results will help create safe antibacterial surfaces in hospitals and food processing plants.

Project Number: SMH010

Grade: 9

Title: Ammonia Runoff Effects on Algal

Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH011

Grade: 12

Title: Can Low+ Lenses and Prisms Increase Reading Rate?

Abstract: I conducted this experiment to determine if low plus lenses and/or prisms may increase a person's reading rate because of their ability to decrease visual distress

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caused by visual aliasing. This was done by first determining the subject's optimum lens and then having her read two graded paragraphs, first without the glasses, then with the optimum lens. After ten minutes the participant read two new graded paragraphs to verify the results. Words per minute and percent change in reading rate were calculated, showing an overall increase of 11.05% during the first test, and a 39.74% increase in the second test.

Project Number: SMH012

Grade: 11

Title: HFCS and Metabolism

Abstract: My experiments' purpose was to show that High- Fructose Corn Syrup and Sucrose aren't nutritionally different. Using a respirometer I tested the respiration rate of the crickets. After setting it up I allowed it to equilibrate then placed it underwater and measured how far water traveled up the pipette and again at 10 and 20 minutes. I repeated this 30 times for each solution; distilled water, HFCS, and Sucrose. My data showed no difference between the respiration of crickets drinking a HFCS solution and drinking a Sucrose solution. In conclusion small amounts High- Fructose Corn Syrup isn't detrimental to people.

Project Number: SMH013

Grade: 10

Title: The Deadly Effects of Dieting Pills

Abstract: The purpose of this project was to test the hypothesis that dieting pills such as Guarana and Hoodia would be fatal to daphnia. First, I obtained daphnia nets and cut them into squares and transported the daphnia to chambers. Then, I dissolved one guarana pill into dilutions of 100%, 50%, and 25%. I put 3 drops of the solution onto the daphnia and counted heart rates. I repeated all the steps listed above for Hoodia and each trial 5 times. I concluded the pills had no serious effects on the daphnia. Perhaps such drugs are not that harmful to humans.

Project Number: SMH014

Grade: 12

Title: Effects of Over The Counter Painkillers on E.Coli

Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH015

Grade: 9

Title: Fast Food Filth

Abstract: My problem is; what types of bacteria will grow in cultures made from vegetables of different restaurants? I chose Wendy's, McDonald's, Eat 'n Park and the grocery store. My hypothesis is that Wendy's and McDonald's would do worst because they would have lower standards. I first gathered my samples from each restaurant, which are lettuce, onion and tomato. I then swabbed and cultured each on separate pre-made petri dishes. I allowed the dishes to grow for 5 days and consulted my instructor for results. It turned out that Wendy's was the one to grow a known harmful strain of bacteria.

Project Number: SMH016

Grade: 11

Title: Bisphenol A and Baby Bottles

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Abstract: Bisphenol A (BPA) is a hazardous chemical used in polycarbonate plastics such as baby bottles. BPA can cause cancer and disrupt the development of the brain and reproductive system. The purpose of this experiment is to leach vast amounts of BPA into the water. To make an analysis of my results, it was necessary for me to expose the bottles to various cleansings and temperatures in an attempt to leach the BPA. Testing involved placing the Amphipoda (scuds) into the baby bottles and observing them after three weeks. Examine the changes in reproduction and mortality rate.

Project Number: SMH017

Grade: 9

Title: Survivorship of E.Coli in Ice Cubes

Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH018

Grade: 11

Title: Music for Your Bacteria

Abstract: It was debated whether or not bacteria could grow and on a set of ear buds over a period of time. This is what I have been examining for my project. Four subjects listened to a set of ear buds for a pre determined period of time (10, 20, and 30 min.). At the end of each time interval, I swabbed each ear bud and inoculated a culture of nutrient broth with the swab. After incubation, (24hours @ 37oC) I compared them to the McFarland Standards, then plated each sample for a colony count. Results thus far are inconclusive.

Project Number: SMH019

Grade: 12

Title: Effect of Exercise on Athletes

Abstract: Many athletes use running to stay in shape. This project tested athletes from various sports to see the effect of running on them. The hypothesis is that the athletes who run the most during their sports, such as soccer players, will have the least change in measurements. Their carbon dioxide output, heart rate, and blood pressure were tested. Each athlete will be tested before and after running. The results should show that athletes who run regularly will have the least amount of change, because their bodies will be most accustomed to running.

Project Number: SMH020

Grade: 12

Title: Lysozyme and S. epidermidis

Abstract: The purpose of my experiment was to test lysozyme under different conditions to find when it is most effective. The pH of the media used for the lysozyme was changed so it would be comparable to the pH of a human mouth and a dog mouth. Through my research, the treatment that offered the greatest percent difference from the control was the pH of a dog's mouth. The effect of pH on the effectiveness of lysozyme may be the reason why dog mouths are cleaner.

Project Number: SMH021

Grade: 9

Title: Carbon vs Commercial

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Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH022

Grade: 12

Title: The Effect of Antibiotics on Bact. Growth in Meats

Abstract: In today's world, many people eat meat everyday. This project tested the ability of organic and non-organic meat to withstand spoilage. In this experiment, organic meat was used as the control because it is raised naturally. The hypothesis is that non-organic meat will stay fresher for a longer time. The organic and non-organic meats were stored one day, two days, and a week. They were tested for bacterial counts by observation and plating on nutrient agar. The expectation of this experiment is the organic meat will spoil quicker than non-organic meat due to the lack of residual antibiotics.

Project Number: SMH023

Grade: 9

Title: The Effects of DHA on Melanoma Cells

Abstract: Purpose: Determine whether Docosahexaenoic Acid (DHA) stimulates or inhibits the proliferation of melanoma cells. Procedure: 1. Establish melanoma cell cultures 2. Treat cell samples with DHA concentrations 3. After 3 days, lyse and fix cells 4. Add azides to cells for microscopic detection 5. Photograph/count cells Results/Conclusion: After 3 days of DHA treatment, cell count decreased in those cells. Compared to the untreated cells, cells with DHA didn't proliferate to the same extent. There was a greater suppression of cell growth as the DHA concentration increased. DHA showed a strong suppressive effect on the melanoma cells' growth.

Project Number: SMH024

Grade: 9

Title: Field Turf Microbial Survivorship

Abstract: To compare bacterial growth on artificial turf beads from older vs. newer fields. PROCEDURE: 1. Turf beads collected from two fields were sterilized. 2. Twelve 0.15-gram bead samples (6/field) and twelve bead-less controls were cultured with 0.1mL of 10^8 cells/mL E. coli. 3. Culture aliquots plated after 0, 30, and 90 minutes. 4. Colony counts compared after 48hrs (ANOVA). DATA: Colony counts at 0 and 30 minutes were similar, but at 90 minutes, growth for old-turf (248 colonies) was significantly higher than for either new-turf (155) or control cultures (178); $p < 0.05$. CONCLUSION: Older turf fragments support E. coli growth

Project Number: SMH025

Grade: 9

Title: MRSA Infection in Athletes

Abstract: There have been increasing reports of the potentially dangerous Methicillin-resistant Staphylococcus aureus (MRSA) infection in high school athletes involved in contact sports. This has raised questions about the possible use of routine MRSA testing. My project examines whether testing all skin infections in this population is worthwhile. A computer decision model was constructed. Simulations were performed using currently available data, including prevalence rates, therapeutic options, possible outcomes, and costs. It was found that at the current prevalence of MRSA, testing is not cost-beneficial. However, as the prevalence increases, testing becomes more cost-effective.

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Project Number: SMH026

Grade: 11

Title: Bacteriophage Genomics

Abstract: There are 10^{31} bacteriophages all over the world, and no one knows how they are related.

Purpose: are virtual restriction enzyme digests based on bacteriophage DNA sequences the same as the actual digests? Using DNA Master and BLAST software, restriction enzymes and gel electrophoresis, differences and similarities among bacteriophage genomes were assessed. Data included several virtual restriction digests and actual restriction enzyme digests of SkiPole and related bacteriophages. SkiPole was found to be in bacteriophage cluster A1. Conclusion: there is a method to compare and differentiate bacteriophages from one another because the actual and virtual restriction digests are similar.

Project Number: SMH027

Grade: 12

Title: The Evaluation of Disinfectants and their Potential Resistance to Bacteria

Abstract: Disinfectants are used to safely sanitize and keep any harmful bacteria from living spaces. This project compares four disinfectants: Clorox Multi- Purpose Spray, Spray 9, Mr. Clean, and Lysol Kitchen and Bath Cleaner. It was hypothesized that Spray 9 would be the most efficient at killing bacteria. Filter disks were soaked in each disinfectant and placed on a spread plate of Ecoli. The zone of inhibition was measured for each disinfectant. The expected results are that Spray 9 and Clorox Multi- Purpose spray will be the most efficient sanitizers.

Project Number: SMH028

Grade: 11

Title: One Hairy Situation

Abstract: In the horse world, competitors are always looking to dazzle the judges, but not go broke trying. Is there a cheap and effective way to grow a horse's tail longer? This experiment tested whether a wrapped, washed tail or an unwrapped, washed tail grew better. For 45 days every Friday of the week, I washed and braided both tails. However, only one was wrapped. My hypothesis was the washed, wrapped tail would grow better. The results proved the hypothesis correct. The wrapped tail grew 0.4cm more than the other. The results prove wrapping your horse's tail makes it grow faster.

Project Number: SMH029

Grade: 10

Title: New Hope for Breast Cancer

Abstract: This project seeks to find a cure for basal-like breast cancer, a very aggressive subtype that is associated with younger population. Unlike other breast cancers, basal-like breast cancer lacks hormone receptors, leaving no options for chemotherapy. The hypothesis is that basal-like breast cancer cells will express the CSPG4 marker. This experiment tests for the expression of CSPG4 antigen by staining the tissue samples with a CSPG4 antibody that was shown to inhibit the proliferation of cancer cells. 100% of the basal-like breast cancer cells express CSPG4. This study brings new hope for women suffering from this very devastating breast cancer.

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Project Number: SMH030

Grade: 12

Title: Odor Free Clothes

Abstract: Fabric treated with TiO_2 is said to oxidize bacteria when exposed to UV light. I tested this in my experiment by treating cloth and using untreated cloth as my control. I inoculated a number of both with *Staphylococcus epidermidis*, placed the fabrics in a sanitized glass baking dish, and exposed them all to sunlight for the average time a person spends in the sun everyday. I then contact plated the cloth samples and compared growth. Thus far results are inconclusive however further testing will be conducted.

Project Number: SMH031

Grade: 9

Title: Bacteria and Contact Lenses

Abstract: Contact lenses will be worn for a specified amount of time. They will then be cleaned using various solution and methods. The clean contacts will be placed in a growth medium and incubated. Bacterial colonies will be counted and the data analyzed.

Project Number: SMH032

Grade: 9

Title: How Do Foods Affect Heart Rate?

Abstract: Will the food you eat everyday increase or decrease your heart rate? Hypothesis: How different types of food will affect your heart rate; by making it go faster or slower. A brief explanation of the experiment is as follows: Ten food products were chosen to see if consuming them would increase or decrease heart rate. Before eating the foods, a resting heart rate was obtained. The measurement was taken at two minutes, five minutes, and ten minutes intervals after. Products with higher carbohydrate concentration proved to increase heart rate. Those with high protein content decreased heart rate.

Project Number: SMH033

Grade: 12

Title: Effect of UV Rays on *E. coli*

Abstract: *E. coli* is a bacteria found in most organisms, where usually harmless. But some strains can make people very sick. This project tests which duration and wavelength of light (UVA, UVB, or UVC) will most effectively kill the *E. coli* bacteria. The hypothesis is that UVC light will be the most effective. The experiments will be conducted by exposing *E. coli* to different light durations and wavelengths for specific times (5, 30, 60, 120 minutes, 24 hours). UVC is expected to be the most effective, and may be useful for sanitation purposes, such as in kitchens and bathrooms.

Project Number: SMH034

Grade: 10

Title: Doctor Cell Phones and Beepers

Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH035

Grade: 10

Title: Antibiotic Effects of Ground Ivy

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Abstract: The antibiotic effects of ground ivy were tested on E. Coli and Staphylococcus epidermidis by exposing the bacteria to inhibition disks soaked in various concentrations of ground ivy solutions. Zone of inhibition were measured, and it was determined that ground ivy had no antibiotic properties given the concentrations and types of bacteria tested.

Project Number: SMH036

Grade: 11

Title: Loss of Antibiotic Resistance

Abstract: There are two types of antibiotics: bacteriostatic, prohibiting the reproduction of bacteria, and bactericidal, killing bacteria (Dictionary.com). Over time, some bacteria develop a resistance to certain antibiotics. Tetracycline, a bacteriostatic antibiotic, is a component of many acne medications (Tyler Pharmacognosy). In my experiment I am testing to see how long it takes Staphylococcus epidermidis to lose its tetracycline resistance. To do this, I am incubating S. epidermidis in tetracycline broth. Results so far have not resulted in a tetracycline-resistant strain.

Project Number: SMH037

Grade: 12

Title: S.mutans Response to pH

Abstract: The FabM enzyme makes Streptococcus mutans acid resistant by making C-chains, the main function of S.mutans' membrane fatty acids, grow longer in membranes of S.mutans. Stunning the enzyme to make the S.mutans less acid resistant by making lower pH conditions was the goal. Replicated saliva with a low, yet tolerable to the mouth pH was used to affect the reproduction and survival of the S.mutans on BHI agar plates in CO2 conditions and no CO2 conditions. Thus far, my results have yielded more growth of S.mutans in non-acidic saliva than acidic saliva on BHI agar plates in no CO2

Project Number: SMH038

Grade: 10

Title: Do Disinfectants Affect Bacterial Resistance?

Abstract: The purpose of my project was to determine if the continuous use of disinfectants on bacteria would cause the bacteria to become resistant, and which active ingredients would produce the most resistance. Bacteria were exposed to the same three disinfectants for seven days at regular intervals. The most resistant bacteria from each disinfectant sample were swabbed and used for inoculation of the Petri dishes to be incubated for the next trial. Zones of inhibition were recorded. Data indicated that the most resistance was built up to Bleach and the least to Iodine.

Project Number: SMH039

Grade: 11

Title: White Coats: Boon or Bane?

Abstract: In an effort to decrease nosocomial infection, the UK has instituted a policy banning white coats and apparel beneath the elbow for health care workers. Although clothing can become contaminated with bacteria, there is no evidence that white coats are dirtier than other clothing worn by health care providers. This study compared colony counts of cuffs and lapels of controls, vs. non-white coat wearing clinicians, as well as white coats and the clothing under the white coats. (n= 80 for each group). Non-white coat wearers actually had as much or more bacterial contamination than either controls or white coat wearers.

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Project Number: SMH040

Grade: 10

Title: Bacterial Model of Human Diseases

Abstract: Glycerol metabolism is implicated in many human diseases including diabetes. Using bacteria as a model system, I examined the interaction of two proteins from this pathway. In gram positive bacteria, HPr binds and phosphorylates glycerol kinase (GK). HPr is phosphorylated on a histidine residue. Because phosphorylated histidines have short half-lives, HPr was mutated to mimic phosphorylated-HPr. In my experiment, I measured the binding interaction between wild-type and two mutant HPrs with wild-type GK to see if the mutation increases the binding affinity. Using a surface plasmon resonance, I determined that the two mutations had higher binding affinities than wild-type HPr.

Project Number: SMH041

Grade: 11

Title: Analyzing Milk Quality

Abstract: Refrigerate three containers of 1% milk with same sell-by date, December 25th (Sample A) and three with different date, December 26th (Sample B). Five days after first sell-by date (Sample A) extract 1 mL of milk from each. Dilute samples twice using nutrient broth. Spread solutions over nutrient agar surface in Petri dishes. Place dishes in an incubator set at 32o C for 24 hours. Count number of colonies in each dish. Repeat procedure until number of colonies exceeds 200 (quality limit). Repeat for Sample B. Dispose of supplies properly in hazardous waste bag. Perform statistics and regression analysis.

Project Number: SMH042

Grade: 12

Title: The Effect of Different Diets on Mice

Abstract: Diets play a very large role in everybody's daily lives. This project tested diets high in fiber, protein, fat, and carbohydrates to see the effects they had on weight gain, activity, and health in mice. My hypothesis is that the mice fed the fat diet will become the least active and gain the most weight. Fifteen mice will be put into groups of three and fed a variety of foods such as cheese, chickpeas, pasta, peanuts, and regular pellet food. The expected results should show that the mice fed a high fat diet increased in weight and decreased in activity.

Project Number: SMH043

Grade: 10

Title: Exostosis of the Ear

Abstract: Exostosis is a condition caused by coldwater exposure. It is believed the water pressure pushing against a kayaker's ear as they roll affects the severity. This study determines the effects of coldwater exposure on a kayaker's ears. Obtain subjects with a history of kayaking, and examine both ears for bone growth known as exostosis. A greater severity of exostosis was present in the ear coming out of the water first when a kayaker rolls. Subjects whom did not have enough of a difference in severity of exostosis have the condition present in the ear of the side they roll on.

Project Number: SMH044

Grade: 11

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Title: Magent Stress Remediation on Mammalian Cell Lines

Abstract: The purpose of this experiment was to examine the effects of Trion:Z magnets on the proliferation, differentiation, and survivorship of normal and UV stressed C2C12 cells. C2C12 cells were cultured and exposed to a stressor-both with magnets and without magnets in order to determine if the magnets had any significant effects on the survivorship, proliferation, or differentiation of the cells. Quantitive and qualitative data analyses were performed on the survivorship and proliferation of the cells. Also, a qualitative data analysis was performed on the differentiation of stem cells into skeletal muscle cells.

Project Number: SMH045

Grade: 11

Title: Do Pharmaceuticals Interfere with Gene Expression?

Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH046

Grade: 9

Title: Burn Baby Burn

Abstract: My project finds the amount of calories in different foods by burning them. I made a calorimeter to measure the amount of heat given off by the burning food. I recorded the amount of food burned and the tempertaure change of the water. Then, I figured out the amount of calories in the burned off section of food. For example, half of a marshmallow burned and raised the water to 23.4 degrees Celsius. I calculated that 340 calories burned. I concluded that fatty foods have over twice the number of calories in them as compared to proteins and carbohydrates.

Project Number: SMH047

Grade: 10

Title: Efficacy of Natural Antiseptics Versus Antibiotics

Abstract: Neem oil and turmeric have been used in Ayurvedic (traditional Indian medicine) for over 3000 years. This experiment is designed to determine if natural antiseptics turmeric (*Curcuma longa*) or oil from the neem tree (*Azadirachta indica*) is able to inhibit the growth of *Staphylococcus epidermidis*. *Staphylococcus epidermidis* was applied to 4 Petri dishes, with one plate being control/no treatment, and the other 3 plates being treated with gentamicin, a turmeric solution, and neem oil. Results are pending.

Project Number: SMH048

Grade: 12

Title: The Effect of Green Tea on Cholesterol

Abstract: Green tea is used for many reasons from lowering blood pressure to treating heart problems. This project is testing to find if green tea can lower cholesterol. It is predixted that the group consuming the most green tea will have the lowest cholesterol. Group 1 is given 200mg and group 2 is given 400mg of green tea daily. Group 3 is given 200mg of a multivitamin daily. Tesing was done weekly for four weeks. I expect group 2 to have the lowest cholesterol. Green tea may be a benificail addition to any diet.

Project Number: SMH049

Grade: 12

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Title: Deactivation of T4 Bacteriophages

Abstract: Viruses are considered by the majority of the scientific world as non-living. They are completely dependent on their host cell to replicate. T4 bacteriophages were used in my experiment and the attempt was to deactivate them by exposing them to various sound wave frequencies. After successfully growing several colonies of Escherichia coli B, and introducing the exposed bacteriophages to the said colonies, there have been no positive results in finding the right sound wave frequency to oscillate the bacteriophages to cause it to deactivate. Future work will continue until all plausible frequencies have been exhausted.

Project Number: SMH050

Grade: 10

Title: Antibacterial Spices

Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH051

Grade: 12

Title: An Alternative to PSA-based Diagnosis

Abstract: Prostate Specific Antigen (PSA) levels are used as the clinical standard for detection of prostate cancer, the second major cause of cancer death in the US. However, the PSA is not fully specific to the prostate and is highly variable. Therein, lies a problem; a new method that can accurately and consistently diagnose proliferation of cancer without complications. Post DRE urine metabolomes of men who presented elevated PSA levels warranting a prostate biopsy were analyzed. The novel combination of spectroscopy technologies (NR and GC/MS) provides complementary biomolecular identifications resulting in a thorough view of the urine metabolome, resulting in a potential unprecedented urine screening tool for the early diagnosis of prostate cancer.

Project Number: SMH052

Grade: 9

Title: Effects of RF Radiation on Yeast

Abstract: Cell phones are used by millions of people. When I learned they could be emitting harmful electromagnetic radiation, I designed a project to test this claim. I exposed yeast cultures (*Saccharomyces cerevisiae* wild type a1 strain) to RF radiation within the cell phone range using an RF transmitter and observed for mutations. If the colonies changed to a red color, this meant they were mutated. Out of the 80 total trials, no red colored colonies were observed. In the future, I would try using a different organism and would make slight revisions to my procedure.

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Project Number: SPH001

Grade: 12

Title: Does Correct Tire Pressure Affect Gas Mileage?

Abstract: The objective of the experiment was to determine whether maintaining recommended tire pressure significantly affected gas mileage. An initial gas mileage was first determined for several cars. The tire pressure was then taken and corrected if the tires were over- or under-inflated. The gas mileage was again determined and compared to the original gas mileage using a line trend and a sign test. The cars collectively showed a significant increase when they had the recommended tire pressure. Individually, over half the cars significantly increased. Maintaining the recommended amount of air in tires significantly increases a car's gas mileage.

Project Number: SPH002

Grade: 9

Title: Natural Frequency and Acoustical Environment

Abstract: Natural frequency of various glasses will be determined using Data Studio software, speakers and a microphone. The test will be performed in various acoustical environments. The frequency will be generated by the Data Studio software and output through speakers. The glass to be tested will be placed in the audio field of the speakers. A microphone will be positioned inside the glass to be tested. The frequency will be varied until resonance occurs and the resulting frequency recorded. The various patterns will be analyzed.

Project Number: SPH003

Grade: 9

Title: Proper Posture When Using Computers

Abstract: How can the gender and age of students affect their posture when using a computer? The purpose of this experiment is to spread awareness about back ergonomics and the importance of it. Fifteen male and fifteen female middle school students were tested while they completed a survey on the computer. While taking the survey, several angle measurements of their back and the computer were recorded. According to the data in this experiment, most students did not have proper posture while using a computer and may be at risk for back problems due to their lack of knowledge about ergonomics.

Project Number: SPH004

Grade: 12

Title: Precision/Accuracy Pistol Holds

Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH005

Grade: 9

Title: Lubrication Domination

Abstract: In my project I compared which of four lubrications (soap, Petroleum jelly, oil, and beeswax) would require the least amount of torque to turn a lag bolt into a premade hole I used a spring scale and a wrench to measure the torque required for the bolt to screw in. I tried five lags in three sets of five holes with a different amount of space in each hole. After my experiment, it turned out that the different lubrications worked out better for different types of holes and some did not perform as well. I came to find out after my experiment that my

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hypothesis of beeswax was correct. Oil seemed to be working well in all other types of holes but it had no effect at all on tight spaces. Over all, beeswax worked the best and soap worked the worst.

Project Number: SPH006

Grade: 10

Title: How Does Temperature Affect Magnets

Abstract: The Purpose of my experiment was to determine how temperature would affect the strength of NdFeB, SmCo, Ceramic magnets. I began testing by finding the mass of a container of steel bb's and then lowering a magnet, heated to the desired temperature, into it, then finding the mass of bb's it lifted. I repeated this procedure for a total of 900 trials. After I analyzed my data, I found that the NdFeB magnets lost 40.68% of its strength, SmCo lost 14.47% and Ceramic lost 21.24% of its strength. My experiment proved that heat causes magnets to lose their strength.

Project Number: SPH008

Grade: 9

Title: Force On Varying Wing Shapes

Abstract: The purpose of this experiment was to determine how much force acts upon wings of different curvatures. This is also to propose solutions for more efficient and durable wings. The variables in this experiment were the amount of curvature for each of the three wings, and the force in Newtons that acted upon them in a controlled wind tunnel.

Project Number: SPH009

Grade: 10

Title: Seebeck Effect Energy Recycling

Abstract: A thermoelectric cooler (TEC) utilizes the Seebeck Effect to convert a temperature differential between two sides of a cooler into electrical energy. This work investigated the energy recycling capabilities of a TEC. The power input to a heat source (resistor) and power output of a TEC with attached heatsink were compared to determine that 2.25% of the energy could be recovered. Recycling electricity generated by the TEC to power a CPU fan and cool the heatsink, increased efficiency to 5.3%. The benefits from this technology are improved cooling and performance in computers and energy recycling in electrical or hybrid vehicles.

Project Number: SPH010

Grade: 10

Title: Wireless Interference

Abstract: The purpose of my experiment was to find out what materials weaken the signals the most for wireless routers. I had a laptop wirelessly connected to the router and then walked away from the router until connection was lost. I recorded this distance. I then surrounded the router with different materials and recorded what distance my laptop disconnected from the router. The average distances of disconnection are as follows: 250 meters for no materials, 245m for glass and plastic, 231m for plaster board, and 226m for steel. As this data shows, steel weakens the signals the most for a wireless router.

Project Number: SPH011

Grade: 12

Title: Exponential Acceleration

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Abstract: Most simple kinematic problems are solved using a constant value for acceleration averaged over time. The intent of this project was to prove that acceleration is always a variable in a realistic situation. Data from a simulated acceleration trial was sampled using MoTeC race analysis software and velocity, acceleration, and jerk were calculated as derivatives of position with respect to time. The data collected supported the hypothesis, and acceleration did vary greatly. However, recalculating velocity with an averaged acceleration resulted in a 0.3582% error. Race teams study this type of data to help improve driving technique and lap times.

Project Number: SPH012

Grade: 9

Title: Effects on Running Impact

Abstract: The purpose of this experiment is to determine if the speed of a runner slope of a terrain, and condition of shoe will affect the impact sustained by a runner. A runner with an accelerometer attached to the leg ran at a variety of speeds, slopes, and with different shoes. The data proved that the slowest speed was the speed with the least impact acceleration. Flat ground was the terrain with the lowest impact, and the condition of the shoes made no significant difference.

Project Number: SPH013

Grade: 9

Title: How Thick-otropic Is Your Ketchup?

Abstract: Many fluids, such as ketchup, are reported to have thixotropic viscosity, time-dependent viscosity which decreases when the fluid is stressed, returning to its initial viscosity when relaxed. Experiments were conducted to determine viscosity classification of several yield-stress fluids, to see how many of these were really thixotropic, or belonged to other classes. Procedures compared the fluid behavior when 1) unstressed, 2) stressed, and 3) after being relaxed, by allowing fluid to flow down an incline. Data was collected for eight fluids (ketchup, toothpaste, grease, mayonnaise, peanut butter, shaving gel, shaving cream, and clay-sand-water mixture). Only toothpaste and grease are thixotropic.

Project Number: SPH014

Grade: 9

Title: It's More Than Just a Game

Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH015

Grade: 11

Title: Variations of Plectrum Tones

Abstract: With a stringed instrument there is a vast amount of ways to get different tones from the instrument. One variable can be the type of pick (or plectrum) used for playing the instrument. Picks are obviously made of different materials, which I have researched to explain why they produced sounds in the tones they do. To do this project I used 15 homemade picks, a homemade bass guitar (made specifically for this project), and a picking device to assure accuracy in the strike of the pick, which is also a homemade device, and recorded the ones and compared them.

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Project Number: SPH016

Grade: 10

Title: Effect of H₂O on .22 Bullet

Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH017

Grade: 9

Title: Coolest Resistor Positioning

Abstract: I found the position for a resistor to be placed on a circuit board so that it will heat up the least once it has reached a steady-state. I tested it with three different types of resistors: 1/2 watt carbon-film resistors, 1/4, and 1/8. I used thermocouples to find out which of the 8 different tested positions was the coolest once the temperature had reached a steady-state. This showed the way to ensure that modern electrical components would not overheat.

Project Number: SPH018

Grade: 10

Title: How Does Temperature Affect Ferrofluids?

Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH019

Grade: 11

Title: Constrained-Layer Damping

Abstract: The purpose is to find if a constrained-damping layer doubled in size would its affects double as well. I took a cookie sheet, resembling a steel wall, and I placed three different sizes of damping-layer. Then I tested each layer separately by hitting a steel nut off the board. I recorded its sound wave, frequency, and decibels. My data and analysis had shown a pattern that every time you double the size of the layer, the sound decreased by two percent. This pattern also leads to my conclusion that once the layer reached a certain size, the damping affects cease.

Project Number: SPH020

Grade: 9

Title: "How Many Times is too Many Times?"

Abstract: The purpose of the experiment was to see the decrease in magnetism after each magnets drop. The hypothesis was that each magnet would lose some magnetism after every drop. First take 8 magnets and drop them at variables of 5 times but at a height of 1.82 meters. After every 5th drop measure them and record the loss of magnetism in a book. The data showed that after every 5 drops the magnetism would decrease by an average of 3.45 cm. The conclusion that was made was that when you drop a magnet at 1.82 meter it loses its magnetism.

Project Number: SPH021

Grade: 9

Title: The Perfect Shot

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Abstract: My experiment is to figure out what is the most accurate shot if you shoot from your chin, chest or head. In order to do this I will get together 5 people including myself. These people will shoot ten shots from those positions. They will shoot from the foul line. While they shoot I will be recording their data. To prevent them from not getting tired, after they shoot from one position I will have everyone rotate and shoot. When I shoot I will have someone else record my data. After I will analyze the data I have collected.

Project Number: SPH022

Grade: 11

Title: Pragmatic Applications of Cosmic Ray Muons

Abstract: Cosmic rays consist of a bountiful conglomeration of varying particle species such as protons, kaons, muons, and neutrons that enter earth's atmosphere from countless sources within the universe. The abundance of cosmic rays and their energy losses through interaction with matter may be employed to solve practical problems. Cosmic ray abundance per unit squared of area are much lower when these particles pass through materials of higher densities. By comparing cosmic ray count rates between certain locations within caves and pyramids, crevices may be detected, for the rate will be less within these structures' holes. Thus, cosmic rays serve as a convenient reliable mechanism in the detection of crevices and have broad applications in identifying materials based upon their interactions with and distribution of cosmic rays.

Project Number: SPH023

Grade: 11

Title: What a Bunch of Chaos

Abstract: The purpose of my experiment is to find if a double pendulum produces chaotic motion or complex patterns. I will be building a double pendulum and will be using this to observe the movement. I will also be filming the movement of the pendulum so I may slow the movement down and observe it more closely. The variables I will be using are altitude and mass. The project is still ongoing so my data is not yet complete.

Project Number: SPH024

Grade: 12

Title: Piezoelectricity

Abstract: Piezoelectricity involves both mechanical and electrical energy. To create a model of this, both Hooke's Law and the Electricity Displacement Equation are combined. This experiment verifies the validity of this combination. It was found that the equation was relatively accurate.

Project Number: SPH025

Grade: 10

Title: Corrosion and Aluminum Alloy Strength

Abstract: The purpose of this investigation is to determine the strength of different aluminum alloys after corrosion. 12 specimens each of 3 different aluminum alloys were used. 3 specimens of each alloy were set aside. 3 specimens of each alloy were placed in 50% sulfuric acid solution. 3 specimens of each alloy were placed in 25% sulfuric acid solution. 3 specimens of each alloy were placed in 10% sulfuric acid solution. After 48 hours all specimens removed. All specimens transported to Touchstone Research Laboratories. Each specimen was placed in an 810MTS machine and tensile tested. The force required for failure in newtons was recorded. 3003 contains most aluminum lost least amount of strength. 5052

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contains least aluminum, but more metals, came in second. 6061 contains second most aluminum and most other metals, lost the most strength.

Project Number: SPH027

Grade: 10

Title: Rocketry

Abstract: I have built and tested a rocket that is shot from a cannon and then is further propelled by a booster rocket that ignites in flight. I have varied the time delay between launch and ignition and measured its effects on the distance traveled. By conducting 16 tests and analyzing the data, I found that the delay of booster ignition and the distance traveled by the rocket can be compared by the formula "length of delay = -(distance of travel in meters)/25.86 + 4.319" and that this formula is accurate to within +/- 24 m, 84% of the time.

Project Number: SPH028

Grade: 12

Title: The Effect of Temperature on Resistance

Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH029

Grade: 9

Title: The effects of aerodynamics on gas mileage

Abstract: The purpose of the experiment was to determine if aerodynamics effect gas mileage of a car. The car was first filled with a full tank of diesel fuel and outfitted with either the roof rack, bike rack, bike on rack, or with no rack. The car was then driven 42.9 miles and back to the original spot. The tank was then refilled and the amount added was recorded as the amount of fuel used. Each group was tested twice and randomized to prevent weather conditions effecting the data. The bike consumed the most fuel. The hypothesis was supported with the data.

Project Number: SPH030

Grade: 12

Title: Tesla Coil; Light Bulb Illumination

Abstract: Nikola Tesla was an inventor, electrical, and mechanical engineer of the early 20th century with a vision of global wireless electrical power. If this dream could become a reality in modern times the need for fossil fuels would be minimized. By use of a Tesla coil, which first is constructed, an experiment of wireless transmission of energy was conducted to determine which types of light bulb designs are most efficient at receiving wireless power. This experiment determined that halogen light bulbs and fluorescent light bulbs can receive wireless power but incandescent bulbs cannot.

Project Number: SPH031

Grade: 9

Title: Which insulation is most effective?

Abstract: This experiment was designed to find the insulating material with the highest efficiency. To conduct this experiment, a box with a light bulb attached to one side and insulation placed in the middle creating a second section was used. The researcher was trying to determine the insulating material that kept the heat in the section with the heat source

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and out of the other section. In the end, many insulations kept sufficient amounts of heat in the first section, but many of those also let heat into the second section. The nine-inch thick fiberglass performed the best.