



72nd PITTSBURGH REGIONAL SCIENCE & ENGINEERING FAIR

SENIOR DIVISION STUDENT PROJECT ABSTRACTS

April 1, 2011

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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.

**BEHAVIORAL AND SOCIAL SCIENCE –
SENIOR (9TH-12TH GRADE) - SBS**

Project Number: SBS001

Grade: 12

Title: Does Smoking Affect Your Taste?

Abstract: The purpose of this experiment is to test the hypothesis that smoking makes one unable to taste differences between store brand and name brand foods. Smoking and non-smoking participants were asked to taste chips and colas and determine whether they were store brand or name brand.

Project Number: SBS002

Grade: 11

Title: The Mozart Effect in Memory

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

Project Number: SBS003

Grade: 12

Title: Does color have an effect on your memory

Abstract: The purpose of my experiment is to see if color has an effect on what you remember. I also want to see if I can help improve students **Grades** by testing them. If color does have an effect on your memory then text books should be a brighter or darker color so students will remember more when they are studying.

Project Number: SBS004

Grade: 12

Title: The Effect of Lying on Heart Rate

Abstract: My project is on lying and the affects it has on people and their pulse. I took my classmates pulse and heart beat then ask them questions to see if their pulse increased when lying.

Project Number: SBS006

Grade: 9

Title: Color Blind

Abstract: The purpose of my experiment was to see if changing the color of Jell-O™ will affect the flavors distinguished by the volunteer. First, I had to make the Jell-O™. Then I changed the color by adding color dye. Last, I refrigerate. For my next procedure I got a volunteer to taste the Jell-O™ and had them write down what they thought the flavor was. One volunteer got 100%. All other volunteers got between 50 and 75%. My conclusion is that changing the color does affect the flavors distinguished in the Jell-O™.

Project Number: SBS007

Grade: 12

Title: Less or More: The Effect of Exercise vs Diet on Weight Loss

Abstract: For my project I am using six human subjects and I check their weight according to the foods that I have them record the foods that they eat daily. The materials that I am using is notebooks a scale and a binder. I will also create charts for each of my human subjects

BEHAVIORAL AND SOCIAL SCIENCE – SENIOR (9TH-12TH GRADE) - SBS

Project Number: SBS008

Grade: 11

Title: Do people care more about what is being said or who's saying it?

Abstract: The purpose of my science fair project was to find out whether high school students are more easily influenced by the actual content of a statement or by the source of the statement itself. I tested this by giving surveys with a political statement ("Humans are responsible for the increase in global warming.") to 60 students. Thirty of the surveys said the statement was from FOX News, and the remaining thirty surveys said the statement was from MSNBC. By asking how much the students agreed with the statement, I analyzed whether they were influenced by the source or the statement.

Project Number: SBS009

Grade: 9

Title: Analysis of human empathy using pupillary dilation

Abstract: Are people more interested in other's sorrows or other's happiness? A change in pupil size indicates interest, while a stagnant pupil size indicates boredom. Through the experiment involving 80 beings, we now know how certain people react to certain emotions. The difference of these reactions ranging from age to gender. Pupil dilation could be used best by psychologists and doctors to find cures to conditions, such as depression. The pupil dilation could also notify others of another's mood and whether it would be appropriate to confront someone. Let's find out whether you a story can be told through one's eyes.

Project Number: SBS010

Grade: 10

Title: The Effect of Audio on Visual Perception

Abstract: 1. Create three videos with different audio conditions (no sound, low fidelity, and high fidelity; I will have different pictures in background). 2. Show to a group of 20-25 students. 3. After each video, show the students the picture in random order and ask them to tell which (sequence) number the picture was in the video. 4. Collect data. 5. Repeat steps 2 and 3 thrice. 6. Create graphical aids to examine data. 7. Make conclusions.

Project Number: SBS011

Grade: 12

Title: Music and Multitasking

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

Project Number: SBS012

Grade: 9

Title: Effects of Music Genre on Memory

Abstract: Have subjects listen to the same lyrics with different background accompanying music and see how well they can write and recall the lyrics.

BEHAVIORAL AND SOCIAL SCIENCE – SENIOR (9TH-12TH GRADE) - SBS

Project Number: SBS013

Grade: 12

Title: Fact or Flu

Abstract: The swine flu was an epidemic last year. Surveys were given to students to determine whether or not the media had an effect on their perceptions of the swine flu. The results were compared to medical facts in order to determine if perceptions were correct or if people were misinformed by the media. Data collection is still in progress. Results will be on the backboard at the fair.

Project Number: SBS014

Grade: 10

Title: Inescapable Frustration: The Effect on Genders

Abstract: In my experiment I will observe students with a video camera who are given an unsolvable chemistry experiment (fake but realistic chemicals that contain water, food coloring, etc.); I will determine the body language of each freshman who, chosen for this reason, have never enrolled in a high school level chemistry class. Between 5 participants of each gender my data should obtain different types of body languages such as confused looks and/or shrugs. If they achieve coagulation using the chemicals in a time limit of 8 minutes, they shall receive a payment of \$20. However this is obviously impossible and thus will lead to inescapable frustration.

Project Number: SBS015

Grade: 10

Title: Effects of Hormones on Attraction

Abstract: This study focuses on progression of menses in females and the effects that different hormone levels (LH and FSH) have on attraction. Ten different symmetrical and asymmetrical facial pictures were created. Fifty subjects of each hormone group (pre-pubescent, pubescent, and menopausal) volunteered. Each of the subjects chose which face they felt was more attractive. Five trials were completed and the data were compiled and averaged. The data showed that females in this test, regardless of hormone level, tend not to value facial symmetry when determining if a male face is considered "attractive" because the p-Value was below 0.05.

Project Number: SBS016

Grade: 10

Title: Measuring Sports Aggression

Abstract: The problem for this investigation explored if sports fans are more aggressive before or after the big game. This researcher gathered a group of students ages 13-17 and had them take an aggression survey before having them view a sporting event. After the event the subjects retook the same aggression test. The data showed that males are more aggression before and after viewing the sporting event. Females were not aggressive before the sporting event but after the event showed more aggression.

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SENIOR (9TH-12TH GRADE) - SBS**

Project Number: SBS017

Grade: 10

Title: Which child proof bottle is easily opened?

Abstract: I wanted to perform an experiment in order to determine if young children were able to open some types of “child-proof” bottles easier than others. After obtaining permission from school administrators and the test subjects parents 50 students in grades 1, 3 and 5 were asked to open 6 different “child proof” bottle designs. Even though the data collected indicated that the older children were able to open the “child proof” bottles more easily than the younger children. Some “child proof” bottle designs were less effective in preventing children from opening them than others.

Project Number: SBS018

Grade: 9

Title: Do gender groups affect math and language arts performance?

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

Project Number: SBS019

Grade: 11

Title: Classical Conditioning with Visual Cues

Abstract: The purpose of my experiment was to find if a dog will have learned to recognize the different visual shapes and respond accordingly. The hypothesis is that the dog will do so through classical conditioning with visual cue. For the procedure I showed the dog a square (which meant to sit), triangle (was the control) and circle (meant he would receive a dog treat) twice a day for 37 days and I recorded how long it took him to respond. The hypothesis was supported because the dog responded accordingly within the 37 days of the experiment.

Project Number: SBS020

Grade: 11

Title: How does political affiliation affect perception of global issues?

Abstract: The purpose of my experiment was to discover if there is a connection between political affiliation and perception of global issues. By better understanding what divides the parties, we can work toward bipartisan government. This will also show where everyday people stand on the political spectrum. Based upon my data, I found that there was no statistical difference between political parties and their perception of global issues, which rejected my hypothesis. However, there was a noticeable deviation on environmental issues between parties. Democrats, on average, placed more importance on issues, such as climate change and deforestation, than Republicans.

Project Number: SBS021

Grade: 11

Title: Determining Differences in Honest Behaviors

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

**BEHAVIORAL AND SOCIAL SCIENCE –
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Project Number: SBS022

Grade: 12

Title: Stereotype threat on reaction time

Abstract: The purpose of my experiment is to find out how the stereotype threat affects the reaction time of females of high school age. My procedure is to test about twenty students of both genders. First I allowed them to take a simple reaction time test. Then I recorded the results. Then I subjected them to a stereotype. I then allowed them to take the test again and recorded the results. my data was the average reaction time of the subjects both before and after being subjected to the stereotype. My conclusion was that the stereotype threat did indeed affect the reaction time of females of high school age.

Project Number: SBS024

Grade: 12

Title: Twin Similarity and How is it Determined?

Abstract: To determine whether twin similarities are more dependent on genetic factors or on the social environment in which the twins were raised. Procedure: Test 1: A survey to test how similar the likes and dislikes of twins are and how much the twins know about each others' personalities. Also carried out on non-twin siblings as a control group. Test 2: A PowerPoint with 17 optical illusions that tests how similar twin perception is. Twins are shown each picture, given 5-10 seconds to analyze and write down the first thing they see. Also given to non-twin siblings as a control. Data: There is a significant difference between identical twins and non-twin siblings in Test 1 and Test 2 does not appear to be significant. When tested on twins who claim to have the same social circles, data appears to have higher average values, showing that there is a slight increase in similarity of personality when the twins are together more often. This was not seen as significant by the Mann-Whitney U Test. Conclusions: Therefore, it appears that genetics do play a more significant role in determining twin similarity.

Project Number: SBS026

Grade: 9

Title: Do Constellations Determine Character?

Abstract: Have you ever read your horoscope in a magazine or newspaper? Did you find the prediction to be true or false? In my project, I created a survey using key personality words to find if an individual's personality matches the characteristics of their corresponding astrological sign.

Project Number: SBS027

Grade: 10

Title: Why The !&%\$ Do We Swear?

Abstract: Can swearing during painful situations reduce a person's perception of pain? This researcher plans to find the answer to this question by recreating a study performed by Britain's Keele University, in which subjects submerge their hands in icy water while saying a non-expletive word in one trial to relieve the pain and a swear word in another trial to relieve the pain. The test results showed that subjects could last longer in the ice water when they were permitted to swear. This data supports the conclusion that allowing yourself to swear during painful situations can temporarily reduce your perception of pain.

BEHAVIORAL AND SOCIAL SCIENCE – SENIOR (9TH-12TH GRADE) - SBS

Project Number: SBS028

Grade: 10

Title: Effect of Music on Athletic Performance

Abstract: This project tried to determine the effect that musical tempo has on a subject's athletic performance. Ten volunteers rode an exercise bike for fifteen minutes, two separate times, once with music and once without. I recorded the miles per hour, as defined by the bike's speedometer as well as the tempo of the songs that were being heard. The results were in favor of my hypothesis, showing that music with tempos of 120+ beats per minute pushed the volunteers to bike faster when compared to slower tempos or no music at all.

Project Number: SBS029

Grade: 11

Title: The New Environmental Activists

Abstract: As the world faces countless environmental issues, it is becoming increasingly important for us, as human beings, to become further educated on the Earth's problems. This project tried to determine which subgroups of society had the highest level of environmental consciousness. A number of questions were asked of 200 people in surveys and the results were compared to see who important environmental issues were to different genders, political affiliations, and generations of people. Results showed that women and democrats were more environmentally conscious, while age showed no change through the subgroups.

Project Number: SBS030

Grade: 11

Title: Perception Vs. Reality: Music and Memory

Abstract: This experiment intends to observe trends between music and memory retention. Students are required to take an online survey and experiment. The results will be collected from each then analyzed and compared. The survey questions will gather participants pre-experimental opinions on music and its effect on their memory; while, the online experiment will test their memory of photo components while listening to music. Research is still being conducted. Final Abstract will be available at my exhibit on Fair Day.

Project Number: SBS031

Grade: 11

Title: Video Game Frame Rate

Abstract: The purpose of this project is to discover how frame rate affects our perception of video games. The method includes the free Scratch program and a premade file. Different combinations of a basic video game character's animated punches were created, and then shown to subjects who gave ratings for them. The results have shown that the further the punches stray from the "best" punch, the lower the ratings they received. This experiment is relevant because of the new advancements in video technology. Producers could use the results of this experiment to make better quality products.

Project Number: SBS032

Grade: 10

Title: The Effect of Expectations on Mental Performance

Abstract: How does an individual's level of expectation on his/her performance affect the actual performance? In order to find out, I designed this experiment, in which I will give 30 test

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subjects a battery of three comparable mental tests. Before one of the tests, I will tell subjects that the test is easy and they are expected to do well; before another I will mention that the test is difficult, and they may not do well. For the final test, I will not set any expectations. I will then grade the tests and determine the effect of expectations on subjects' performance.

Project Number: SBS033

Grade: 12

Title: Scent vs. Memory

Abstract: The purpose of this experiment is to find out whether a scent in a room affects the amount of information students can remember. 300 students, split into 3 groups, were tested in this experiment. Group 1 had a lavender scent in the room, group 2 had a peppermint scent in the room, and group 3 had no scent in the room. All three groups studied the same picture for 5 minutes the first day and then took a questionnaire on the picture the next day to test how much they could recall of the picture.

Project Number: SBS034

Grade: 12

Title: Caffeine vs. Concentration

Abstract: This experiment was designed to test the hypothesis that if a subject studies and takes a test both under the influence of caffeine, then the subject will score better than a subject who is not under the influence of caffeine. The subjects were divided into groups: Group 1 being the subjects who had caffeine both while studying and taking the test, Group 2 having caffeine only while studying, Group 3 having caffeine only while taking the test, Group 4 having no caffeine at all. The results showed no statistical difference between any of the groups.

Project Number: SBS035

Grade: 10

Title: Got O2?

Abstract: The category is vertebrate animal research and fish were used to determine the relationship between ambient water temperature and respiration of *Carassius auratus auratus*. Three goldfish were placed in six different water temperatures: 28.78°C, 24.46°C, 23.36°C, 18.86°C, 17.78°C, 16.68°C, for one minute while counting the number of times the gills opened. For example, the average for fish 1's breathes at the highest temperature was 143.83 breathes and the lowest temperature average was 76.83. So, conclusion shows when the temperature increases the number of breathes increases and when the temperature decreases so did the number of breathes.

Project Number: SBS036

Grade: 11

Title: Effects of Taste, Smell, Touch, and Hearing on Memory Retention

Abstract: The purpose of this project was to determine which of the five senses most directly affect memory retention. Subjects were asked to study various works of art and were then tested about what each remembered from the picture. It was determined the results were not conclusive and additional testing needs to be conducted.

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SENIOR (9TH-12TH GRADE) - SBS**

Project Number: SBS037

Grade: 12

Title: Lie To Me

Abstract: Have you ever wondered if someone was lying right to you? With body language, it can be easy to tell if someone is telling the truth or lies. Body language is the study of conscious or unconscious movements made by a person. These movements can be made when in a conversation or just when walking down the street. I am attempting to “read” people and accurately decide whether they are lying or telling the truth. To determine how truthful someone is being, I set up a camera and video recorded their answers to five questions. They were told to answer three of these questions truthfully and the other two with lies. Which questions they answered truths and lies to was their own decision; otherwise it wouldn't be much of an experiment, would it? When finished asking these questions, my volunteers write down their answers on a piece of paper. The paper is sealed and used as reference after I review the video and decide which answers are lies. My data is mostly simple equations. My average number of questions answered currently is 3.77 out of 5. I believe I will be able to raise that average to at least 4 by the time of the fair. Research is still being conducted. Final Abstract will be available at my exhibit on Fair Day.

Project Number: SBS038

Grade: 11

Title: Beauty and the Brain

Abstract: The reason why I did this particular experiment was because I wanted to see if age does in fact affect the outlook on beauty. To put it simply why you should care is because you'll know the scientific reason why you think a person is attractive, but your relative that is younger might think this same person is ugly. My hypothesis was that in fact age will affect the outlook on beauty. My approach for this experiment was for my subjects to take a simple survey. Writing yes or no if they thought the pictures of people was attractive to him/her. The results are that in the teenage years also seem to be more critical towards people. The child years seem to not fully understand the concept of beauty to its fullest. While the adults living longer than the other two groups can make a better, wiser and more sensible decision. In conclusion my project contributes to the study of psychology, fashion, and regular people.

Project Number: SBS039

Grade: 9

Title: Day by Day

Abstract: The purpose of this experiment was to find the results of memory retention based on the day of the school week. This was tested by having 20 students memorize as many words that they could remember each day of the week. The data results that the memorization level or number of words remembered shows a slight increase as the week goes on. If teachers give students information at least a week before a test and they study it daily the test scores will slightly increase just like the words memorized did.

Project Number: SBS040

Grade: 9

Title: Sleep Deprivation

Abstract: Does sleep deprivation affect a person's ability to remember easily, react quickly, and solve problems? To observe the effects of sleep deprivation, subjects undergo a week of sleeping at a recommended amount of time (8 hours), or were deprived of 3 hours of sleep each night. Subjects then were timed while solving a 64 piece picture puzzle, completing a

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memory game, and participating in a reaction test. Results to this point showed that those participants with 8 hours of sleep have more consistent times for the different tests taken. All results were compared to analyze the effect of sleep deprivation.

Project Number: SBS041

Grade: 10

Title: Multi-Tasking and Driving, Is It Really That Bad?

Abstract: This project was about the use of multi-tasking and driving. The video game Mario Karts was used to simulate the driving aspect. Texting, then making a call, and listening to music simulated the real life aspects of multi-tasking. I chose to do this project because multi-tasking and driving is said to be a dangerous thing, especially for teenagers and I wanted to get an estimate of how dangerous it actually is. The experiment was conducted by having 10 people try the simulation just “driving”, then “driving with multi-tasking. The results showed that multi-tasking and driving was very dangerous.

Project Number: SBS042

Grade: 10

Title: Two Ways of Learning a Language

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

Project Number: SBS043

Grade: 10

Title: Effect of gender on the ability to taste salt/sugar

Abstract: The purpose of this experiment was to determine whether salt or sugar is tasted more intensely in different areas of the tongue. It was learned that all tongues are different, like a fingerprint. Overall, females were more sensitive to salt than to sugar and females tended to have more sensitive tongues than males.

BIOLOGY - SENIOR (9TH-12TH GRADE) - SBI

Project Number: SBI001

Grade: 11

Title: Diet on Goldfish Training

Abstract: The purpose of this science fair project is to determine the effect of a fresh diet vs. a processed diet on the learning ability of goldfish. One fish will have a fresh diet and the other fish will have a processed diet. Both fish will learn how to feed from a wand, go through a hoop, limbo, and slalom. The results were that Fish 1 learned at a faster rate than Fish 2. In conclusion, a goldfish has a greater learning ability when it eats a processed diet because fish tend to eat processed foods faster and can digest it much quicker than that of fresh foods.

Project Number: SBI002

Grade: 11

Title: Antibiotic Effects of Spices

Abstract: In my experiment I was trying to find out if some common spices had any antibiotic effects. I decided to use the spices cinnamon, oregano, and basil. I am making a nutrient agar plate, and sprinkling the spices in certain areas on the dish, and recording the zones of inhibition. I researched the spices and they are expected to have antibiotic effects.

Project Number: SBI003

Grade: 12

Title: Dancing Daphnia

Abstract: Energy supplements substantially affect organisms, large and small, by increasing subjective alertness and raising heart rates. This can yield a positive result on those wanting a quick "pick-me-up" but can it potentially dangerous when used excessively? I believe that when caffeine and guarana are added to daphnia's water, it will increase their heart rate substantially. I will record the beats per minute over a 4 minute time frame for each minute to determine the optimum reaction period. Research is still being conducted. I plan to add other energy supplements to this experiment. Final Abstract will be available at my exhibit on Fair Day.

Project Number: SBI004

Grade: 11

Title: Effects of different antibiotics on bacteria found in the human body

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

Project Number: SBI005

Grade: 9

Title: Lung Capacity and Age

Abstract: Does lung capacity change with age? As you grow older, your lung capacity could get better, worsen, or stay equal. To determine which, this investigation had three age groups exhale into a plastic tube which was inside a large container turned upside down inside a bucket filled with water. The three groups were adolescents ranging from age 13 to 19, adults ages 20 to 59, and elders ages 60 to 90. The subject would blow all the water out of the container they could, and this researcher measured how much water was displaced by air. The results so far show that the adults in this test have the greatest lung capacity. Further analysis of data may show more results.

BIOLOGY - SENIOR (9TH-12TH GRADE) - SBI

Project Number: SBI006

Grade: 12

Title: To use HOOH or Not to Use HOOH

Abstract: Research indicates that farmers and gardeners use a mixture of hydrogen peroxide and water to help their plants grow faster. When hydrogen peroxide is exposed to any compound it breaks down into water and oxygen molecule. The purpose of this experiment is to see if there is any effect on grass when it is sprayed with hydrogen peroxide. I will spray the grass with a mixture of hydrogen peroxide and water. Also, I will spray the grass with water and hydrogen peroxide.

Project Number: SBI007

Grade: 12

Title: Fish Waste Fertilizer on plant

Abstract: The main purpose of this experiment is to see if fish waste will cause a plant to grow more than normal fertilizers and emulsion fertilizers effect their growing rate. This is one of the most environmentally friendly fertilizing options for your plants.

Project Number: SBI009

Grade: 12

Title: Minty Fresh

Abstract: The purpose of my experiment is to determine if mint gum produce less bacteria than sugar gum. My procedure is: 1st I'm going to have the subject rinse their mouths with mouth wash; 2nd I'm going to swab the subject's mouth; 3rd I'm going to give the subject a sugarless mint gum let them chew for five minutes and then swab subjects mouth; 4th I'm going to put the swab in a Petri Dish with agar in it; 5th I will observe the amount of bacterial growth and record; 6th I will repeat the same steps with the mint gum that contains sugar as well as the sweet gum with and without sugar.

Project Number: SBI010

Grade: 12

Title: Ocean Acidification

Abstract: As we continue to emit CO₂ into the atmosphere from burning fossil fuels, the pH of ocean water will continuously decrease. When CO₂ is absorbed by ocean water it produces H₂CO₃. This process prevents many shelled marine creatures from building and maintaining their shells. This process also results in acidosis, which can lead to reproduction decrease in important species. To measure the effect on shells, mass seashells before and after placing them in ocean water altered to mimic the pH decline. To measure the effect on sea urchins' fertilization rate, monitor the rate in water altered to mimic pH decline.

Project Number: SBI011

Grade: 9

Title: Plant Growth Influence

Abstract: People grow plants all the time for their garden. This experiment is designed to see what light exposure time will grow hydroponic plants the best. Plants were planted in a hydroponics station and were exposed to six, twelve, and twenty-four hours of light. Plants were also grown in the standard way as the control. The plant biomass was measured.

BIOLOGY - SENIOR (9TH-12TH GRADE) - SBI

Hydroponics could be a way to grow plants on Mars, because there is no soil. Growing plants on Mars could create an atmosphere acceptable for humans to live in.

Project Number: SBI012

Grade: 11

Title: Ibuprofen Effect on Gene Express

Abstract: Ubiquitous in medicine cabinets across the country, ibuprofen is known as an effective NSAID. Its effect on gene expression, however, remains unclear. This experiment sets out to assess ibuprofen effects on the gene expression of *E. coli*. An ONPG assay was utilized, with three different metabolic methods incurred on varying concentrations of ibuprofen. This test centers on the induction and repression of the lac operon. A significant change in spectrophotometer readings entails an alteration of this mechanism, and therefore gene expression. Various statistical analyses indicated that ibuprofen did not significantly affect gene expression.

Project Number: SBI013

Grade: 10

Title: The Effects of Temperature on pH Levels

Abstract: The pH scale identifies how acidic or basic an aqueous solution is. The scale ranges from 0, which is the most acidic, to 14, which is the most basic. Each pH unit represents a tenfold change in the concentration of the H⁺ ions in the solution. Most living organisms can only survive within a limited pH range. There are certain factors that affect the pH of substances. The purpose of this experiment is to determine what effect, if any, a change in temperature would have on the pH of a substance. Research is still being conducted. Final **Abstract** will be available at my exhibit on Fair Day.

Project Number: SBI014

Grade: 11

Title: Vines and Their Tendrils

Abstract: This experiment studies vines, specifically, tendrils to determine what type of supports they prefer. Plants will be grown in an ideal environment and once the tendrils form this researcher will test different supports with 10 plants for each support. Tendrils will be observed at regular intervals and observations will be recorded.

Project Number: SBI015

Grade: 10

Title: UHT is Not For Me!

Abstract: The purpose of the experiment was to see if lactose was denatured enough by heating milk that lactase couldn't break it down. I heated the milk to temperatures in Fahrenheit of 250, 275, 300, and 325 for four seconds each. Then I added a lactase supplement to the milk and tested it with a glucose testing strip to see if the lactose had been denatured. For the results, the strips showed that for every time the temperature went up, the glucose numbers went down. One can conclude by this that lactose is denatured by heating milk.

BIOLOGY - SENIOR (9TH-12TH GRADE) - SBI

Project Number: SBI016

Grade: 9

Title: Does Temperature Affect the Chirping of Crickets?

Abstract: The purpose of this project was to determine whether or not temperature affected the number of chirps in crickets. The number of chirps from crickets was counted and the temperature was recorded for various times of day. It was determined that a positive correlation occurred between temperature and the number of cricket chirps.

Project Number: SBI017

Grade: 11

Title: Stressed? So Are Daphnia

Abstract: Lead and Cadmium are heavy metals known to be in our environment, such as the air and waterways. The purpose of my experiment is to test and see if using sub lethal concentrations of these heavy metals can create an environment stressful enough to cause daphnia to produce ephippia. I will observe the daphnia's mortality rate, along with the rate of parthenogenic reproduction versus the production of ephippia.

Project Number: SBI018

Grade: 10

Title: What effect does colored mulch have on a plant?

Abstract: The purpose of this project was to determine if different colors of mulch affect plant growth. Black, natural and red mulches were placed around zinnia plants. The height of the plant was measured for a period of two weeks. Other physical traits of the plants were also recorded.

Project Number: SBI019

Grade: 11

Title: What is the effect of sodium acetate in nematodes?

Abstract: In my experiment I will test the attraction of nematodes with sodium acetate. My hypothesis is that I think the nematodes will be attracted to the sodium acetate. I will run the test at least three times with 10 nematodes per trial. My independent variable in this experiment is the amount of sodium acetate I will use. The dependent variable is the number of nematodes attracted to the sodium acetate. The controlled group will have no sodium acetate added to them.

Project Number: SBI021

Grade: 9

Title: Apple Genes

Abstract: Commercial apple trees might be susceptible to disease caused by inbreeding of tree DNA. Apple producers have not determined if different apple varieties could survive disease. One way to determine if apple trees could survive disease would be to compare their DNA using gel electrophoresis. The best DNA for comparison would be the most visible DNA after 15 minutes of having DNA set at room temperature. This study focuses on different methods of extracting apple DNA to run on gel electrophoresis. After completing all 6 trials with 5 methods I found that the best method was a professional grade kit.

BIOLOGY - SENIOR (9TH-12TH GRADE) - SBI

Project Number: SBI022

Grade: 12

Title: Ribozyme Structures

Abstract: The purpose of my experiment is to compare the secondary structure of ribozyme sequences of different species. To do this, I collected sequences and inserted them into a secondary structure prediction program. The secondary structure of ribozymes from Homo Sapiens was very similar to that of Bos Taurus when comparing the number of loops. In addition to several other tested ribozymes, a Cancer Pagurus ribozyme was tested; it proved to be most unlike any other tested ribozyme. In conclusion, I gathered that species that are similar have comparable ribozyme structures probably due to their cells' similar functions.

Project Number: SBI023

Grade: 12

Title: Urchin for Answers

Abstract: There is a concern now that pharmaceuticals are possibly contaminating the water that billions of people drink every day. Although this concern most likely goes unknown by millions, these pharmaceuticals can be harmful in numerous ways. The purpose of this experiment is to investigate how small concentrations of three pharmaceuticals (ibuprofen, acetaminophen, and aspirin) might affect an organism's reproductive capabilities. Using sea urchins as a model, the fertilization rate of gametes in concentrations of aspirin, acetaminophen, and ibuprofen will be assessed

Project Number: SBI024

Grade: 11

Title: Peaking Peepers

Abstract: What is the most effective way of hatching fertile eggs with a still-air incubator?

Procedure: Three still-air incubators will be obtained along with three dozen quail eggs and three dozen chicken eggs. One dozen quail eggs and one dozen chicken eggs will be split among the three incubators. Half of the chicken eggs and half of the quail eggs will be turned three times a day and the other half of the chicken and quail eggs will be turned five times a day. One incubator will be covered and kept in complete darkness 24 hours a day. Another incubator will be uncovered and kept under constant light 24 hours a day. The last incubator will be in 12 hours of darkness and 12 hours of light. The eggs will stop being turned after day 18 so that they are not injured, in that they will hatch in three days. **Data and Conclusion:** Unfortunately, I received bad eggs and the hatch did not turn out well. I know that the temperature was not a factor because it was always on or around 37.5 degrees Celsius. Eggs hatched from all three incubators and, if the temperature was off at all, then none of the eggs would have hatched. I then called Ward's scientific, where the eggs were sent from, and they relayed to me that they have been receiving reports of bad eggs and that they would send me two dozen new fertile eggs at their own expense. The new eggs that they sent me were brown eggs this time instead of white eggs. I have restarted my experiment with these new eggs in hope that they are of good quality. The final abstract will be available at my exhibit on Fair Day. The experiment is still in process and research is still being conducted. From my original experiment one chicken and five quail hatched. In the covered incubator, one chicken hatched from an egg that was turned three times a day, one quail hatched from an egg that was turned three times a day, and another that was turned five times a day. From the 12 hour covered/12 hour uncovered incubator, one quail that was turned three times a day was hatched. From the uncovered incubator, one quail egg that was turned three times a day hatched, and another that was turned five times a day hatched. These results are inconclusive due to the frailty of the eggs.

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Project Number: SBI025

Grade: 11

Title: Estimating Family Relationships from Genomic Data

Abstract: How reliably can relationships between related individuals be determined based on only genetics? The goal is to determine the accuracy for determining this relationship based on an older method and a newly proposed method. Genetic data will be simulated using a program that uses provided information such as the identity by descent values and allele frequencies. This simulated data will be analyzed using the two methods. The results will then be compared to the expected value, to find the error. The errors will be used to determine the accuracy of the estimated relationships.

Project Number: SBI027

Grade: 12

Title: Got calcium?

Abstract: In order to examine the amount of calcium needed for optimum growth and best possible exoskeleton hardness of crayfish implement the following. Crayfish will be separated into 3 treatment groups. Each treatment group will consist of 8 individual containers with 150 mL of natural water and a single crayfish (*Cambaridae cambarellus*). Three different concentrations of calcium chloride will be used. The concentrations will be as followed: 1% CaCl₂, 2% CaCl₂ and one with natural water. Once the crayfish have molted, remove the shed exoskeleton and measure the thickness and hardness by dropping different amount of weight on the shell.

Project Number: SBI028

Grade: 9

Title: Bacterial Resistance

Abstract: There are many products with high concentrations of disinfectant chemicals that people use daily. The purpose of this project was to test different dilutions of common household disinfectants to see how low of a concentration will still kill bacteria. During the experiment, five different antiseptics were tested; varying results were received. The results were determined by measuring the zone of inhibition after incubating the Petri dishes. Concluding results for this experiment were that the higher concentrations kill the most bacteria and that lower concentrations kill some bacteria but at times none at all.

Project Number: SBI029

Grade: 11

Title: The Effect of Transpiration on pH

Abstract: The purpose of my experiment is to test the effect of transpiration on the pH of water (for example, acid rain). I was curious how much acid was absorbed in the plant and how much the plant helps purify the acid rain. I am going to take 2 bamboo plants and put it in my different pH solutions. Then, I will put a vegetation bag on the plant to get the transpired water. I will then test the pH of the transpired water.

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Project Number: SBI030

Grade: 9

Title: Do Bats Prefer Brown or Black Bat Boxes?

Abstract: The purpose of this project was to determine whether bats prefer brown or black bat boxes. Two bat boxes, one black and one brown, were placed in an environment that bats normally inhabit. The number of bats entering each box was recorded.

Project Number: SBI031

Grade: 11

Title: Analyzing Antioxidants: Phase 2

Abstract: Considering the important medical applications of antioxidants, this experiment was designed to test antioxidant supplements in a biological context. Germinating pea seeds were exposed to solutions of the antioxidant supplements vitamin C, polyphenols, and alpha lipoic acid. A control group of pea seeds germinated in only distilled water was also tested. The rates of cellular respiration of the germinating pea seeds were obtained from respirometer analysis. The antioxidants were compared based on their effect on the rate of respiration. Research and analysis of data is still underway and a finalized abstract will be available at the exhibit on Fair Day.

Project Number: SBI032

Grade: 10

Title: Stress on Sport Playing High School Students

Abstract: This experiment was done on iridology, which is the study of the iris. Through nerve filaments, muscle fibers, and blood vessels in the eye, the iris will show tissue changes. Through marks, signs, and discoloration in the iris, weaknesses and strengths are revealed about the body when compared to an iridology chart. This experiment focused on how well students can handle stress. It was concluded that high school students who play a sport can handle stress better than those who do not play a sport, but they were stressed out more. Iridology can be very beneficial, by helping a person be aware of what is going on in their body.

Project Number: SBI033

Grade: 12

Title: Estrogen & Amphipods

Abstract: Effects of the environmental estrogen ethinylestradiol (EE) on male fish have been examined before. Findings were that males developed female traits like producing eggs and females organs. Amphipods from neonates until maturity exposed to 10 g/L of ethinylestradiol will be examined. Precopulatory mating pairs will be studied to see if EE effects female's choice of male. This will be done by tethering the three males (EE, Ethanol, and Control) to small stones then letting female choose. This will help conclude if males are becoming "feminized" because a female will not mate with the inferior male if there is a better choice.

Project Number: SBI034

Grade: 11

Title: Stability Test

Abstract: The purpose of this experiment was to check for a correlation between arch height and stability. This researcher built a Gait-Arch Mechanism to measure the height of a foot

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arch. Then a meter stick was used to measure flexibility/stability forward, backward, left and right. Over a period of two months, 25 people were tested. To this point, the data showed that people with a higher arch have more stability. Further testing will show if there is a correlation between arch height and stability is a major affecter of stability.

Project Number: SBI035

Grade: 9

Title: Making an Eggcelent Egg

Abstract: The purpose of this experiment was to discover if the food given to a hen affects the quality of the egg it produces. Hen A was given scratch grain, hen B was given 20% layer crumbles, hen C was given both scratch grain and 20% layer crumbles, and hen D was given scratch grain and oyster shells. All hens were fed unlimited amounts for one month. Each hen's daily eggs were measured for long circumference and short circumference (inches) and weight (grams). The data showed that scratch grain will cause a larger egg. All other foods didn't have an exact effect.

Project Number: SBI036

Grade: 11

Title: Bacteria in a Vacuum

Abstract: The purpose of my experiment was to determine if *Bacillus subtilis* could survive exposure to vacuum. I placed two samples of bacteria, in broth, into the vacuum chamber and placed two other samples into a blacked out chamber for twenty-two and one-half hours. I did this four times. I diluted all of the samples to 1/100th their original concentrations, and then inoculated nutrient agar plates with the bacteria sample. Finally, I incubated the plates at 300C. My data consisted of eight control and experimental samples. I concluded that the exposure to vacuum didn't affect the survival of *Bacillus subtilis*.

Project Number: SBI037

Grade: 12

Title: Reaction to Low pH Water

Abstract: The purpose of my experiment is to determine if acidic H₂O affects the response of *Daphnia Magna* to predators. First I will make solutions of sulfuric and nitric acid to enable me to acidify my pond water. I will observe the daphnia in their units of acidic pond water, and will observe their rate of reproduction and their heart rate. After observing these changes I will then introduce the scent of the phantom midge by boiling phantom midge larvae in water and placing some of the water into each unit. I will then observe any changes in the daphnia's behavior

Project Number: SBI038

Grade: 11

Title: Follow Your Instinct, Termite!

Abstract: Why do some termites have weird reaction as head banging (or some of them follow their tails as they smell ink) and other do not?

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Project Number: SBI039

Grade: 10

Title: Cell Density on Proliferation of Aortic Smooth Muscle Cells

Abstract: Determine the density of aortic smooth muscle cells that generates the greatest amount of proliferation.

Project Number: SBI040

Grade: 10

Title: Arabidopsis thaliana vtc2

Abstract: The purpose of this experiment is to observe gravitropism in Arabidopsis thaliana wild-type and vtc2 mutant roots. I was unable to find statistical studies on the roots of the Arabidopsis thaliana plants. I grew them in rockwool which allowed periodical observations of their roots. The primary root growth depth of the wild-type was greater than the vtc2 mutants and the lateral root growth depth was also greater in the wild-type plant when using a two-mean hypothesis test. In future research, I plan to take a closer look at the root structures and amyloplasts are different.

Project Number: SBI041

Grade: 9

Title: Can Fish Remember a Task over Time?

Abstract: The purpose of this experiment is to test the memory of goldfish. There will be an experimental and control group. The experimental group will be trained to traverse a path in response to an auditory cue in order to receive a reward of food. After training the fish in the experimental group will be tested to determine their ability to complete the task at two, five, nine, fourteen, and twenty days after training. The control group will be tested in the same manner, without previous training. The goldfish's ability to complete the task will be measured in seconds.

Project Number: SBI042

Grade: 11

Title: The life span of fruit flies

Abstract: The purpose of my experiment is to determine the life span of fruit flies based on food. I will use five different types of food, four fruits and one starch. There will be ten fruit flies on each choice and based on how long they live will determine which food was the best choice for a longer life span.

Project Number: SBI043

Grade: 12

Title: Allelopathy in Aquatic Systems

Abstract: The aquatic, invasive plant Myriophyllum spicatum is known to take over aquatic ecosystems due to its ability to rapidly reproduce. Also, it is reported to have allelopathic tendencies that inhibit the growth of blue-green algae, and it is also reported to interfere with the development of and sometimes kill mosquito larvae. I will prepare mesocosms for Oscillatoria, a blue-green algae, and mosquito larvae, and then I will introduce M. spicatum into half of the mesocosms in an attempt to observe how allelopathy can affect organisms in an aquatic ecosystem. The M. spicatum will decrease the amount of Cyanobacteria, and will inhibit the mosquito (Culex pipiens) larvae's development.

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Project Number: SBI044

Grade: 9

Title: Irrigation Systems on Plants

Abstract: The purpose of my experiment is to determine how much water a drip irrigation system should apply to a plant in order for it to grow. I did this by setting up three different test groups, each with different drip rates, and measured which group grew the most. Through my experimenting, I found that the group with a drip rate of 3.8 liters per hour grew the most followed by the group with a drip rate of 1.9 liters per hour. I found that the group with a rate of 1.9 liters per hour was not enough water for the plant.

Project Number: SBI045

Grade: 9

Title: Effect of protein variation in chicken feed on egg wt.

Abstract: This experiment aims to determine how protein enhanced feed affects egg weight in chickens, and which protein supplement has a greater effect soybeans or barley. The procedure is: divide flock in half and feed for a week, weigh the eggs; calculate an average. Then feed half normal feed and the other half feed replaced with 20% soybeans, calculate the average. Repeat steps except use barley instead of soybeans. Data has shown eggs will be heavier with more protein; however it is early in my experiment. This experiment is still in progress, but results will be ready for Fair day.

Project Number: SBI046

Grade: 11

Title: Using Light to Disinfect Water

Abstract: Many people in the world do not have access to safe drinking water. Simple inexpensive water disinfection systems have been developed to decontaminate water using plastic bottles and sunlight. This experiment answers the question as to the time required to decontaminate water using ultraviolet light. The procedure involves exposing stream water to ultraviolet light for 12, 24, 36, and 48 hours. After exposure to the ultraviolet light, each water sample was placed in a soy agar medium, and observed over a 96-hour period for bacterial colony growth. Research is still being conducted. Final abstract will be available at my exhibit on Fair Day.

Project Number: SBI047

Grade: 11

Title: How Cooking Affects Mice Metabolism

Abstract: I will have 10 mice, and monitor the affects of cooked vs. uncooked food on physical growth and the rate of metabolism. I will wean the mice onto a diet of vegetables, and use a within subjects design to test both variables. I will measure their oxygen consumption during feeding, as well as record their change in body weight over the span of the experiment in order to determine the energy cost of digesting both kinds of food. Research is still being done and a final **Abstract** will be available at my exhibit on the day of the fair.

Project Number: SBI048

Grade: 9

Title: What kind of cheese grows mold the fastest

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

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Project Number: SBI049

Grade: 11

Title: How sweet it is. . .

Abstract: There have been many artificial sweeteners discovered over the years. Most claim to have all the taste of sugar, none of the calories, and no harmful side effects. This project will attempt to determine, by way of experimenting on radishes, if this is really a win-win alternative. The plants will be watered with solutions of water and/or a dissolved sugar substance. The five major sugar products will be used; white sugar, sucrose, aspartame, saccharin, and stevia extract. Their general physical health will be observed over the course of the experiment. At the end of 30 days, the plants will be tested for their vitamin C, protein, fat, and sugar content. My hypothesis is that the sucrose and aspartame will cause adverse health effects in these plants. Research is still being conducted. Final abstract will be available at my exhibit on Fair Day.

Project Number: SBI050

Grade: 11

Title: Effect of Artificial Gravity on Radish Seed Germination

Abstract: This test studied whether artificial gravity would cause orthogravitropism, vertical growth, or if it would cause diagravitropism, which is horizontal growth, in radish plants. It was predicted the turntable's rotation would cause stunted growth compared to those not grown on it. The roots would grow parallel to earth's surface instead of perpendicular. The turntable exerted enough force in a direction different from Earth's gravity to act as artificial gravity. After two tests of fourteen days each, it was found that the radish plant's roots and/or stems grew horizontally to earth's surface and, overall, the growth of the plants was stunted.

Project Number: SBI051

Grade: 11

Title: Does a magnetic field affect the length of time it takes for *Vanessa cardui* to undergo metamorphosis?

Abstract: This project tried to determine if a magnetic field affects the process of metamorphosis in *Vanessa cardui*. The larvae were grown with a variety of magnetic strengths. The number of successful butterfly developments as well as other physical characteristics were observed. It was determined that the data was inconclusive.

Project Number: SBI052

Grade: 12

Title: What are You Really Killing

Abstract: Herbicides and pesticides are said to have a negative effect on the environment. I'm testing what effect two chemicals found in herbicides and pesticides have on aquatic systems and specifically, *daphnia pulex*. Using *daphnia pulex* as my model organism I'll administer 6.8mg/L of Glyphosate and 1.40mg/L of Bifenthrin to them in pond mesocosms and use a 96 hour toxicity test. Other Pond mesocosms will be setup and administered the same chemicals but the *daphnia pulex* will not be placed into these mesocosms until the breakdown of the two chemicals occurs.(Breakdown rate based on Toxnet). A toxicity test will be assessed.

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Project Number: SBI053

Grade: 12

Title: fruit ripening and ethylene

Abstract: My project is about fruit ripening using the plant hormone ethylene.

Project Number: SBI054

Grade: 10

Title: Effect of Light Wave on Algae

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

Project Number: SBI055

Grade: 11

Title: Do You See What the Butterflies See?

Abstract: All animals can become endangered, including butterflies. The purpose of the experiment was to see if the butterflies were more attracted to feeders painted with UV colors than to visible light colors. A feeder with UV paint and a feeder without were placed in with the butterflies and levels of food were recorded each day. For the most part, all data was very similar, but in one testing group, the UV did achieve better results. To create an environment for safe reproducing, it would be beneficial to use UV colors to attract butterflies.

Project Number: SBI056

Grade: 11

Title: Maximizing Lipids in Algae

Abstract: Petroleum fuels are quickly becoming obsolete as an energy source, and biofuels such as ones from algae are poised to replace them. The purpose of this experiment is to find the optimal nitrate and phosphate levels for scendesmus algae. Twelve beakers were set up and grown over the period of one week, and the final results were taken by spectrophotometry. It was found that algae grow most optimally at approximately 0.375M of phosphates, while there was no point of maximum growth for nitrates. Future experimentation is needed to extend the range of concentrations, as well as to test other nutrients.

Project Number: SBI057

Grade: 12

Title: Maggots Need Vitamin D Too

Abstract: Research indicates that there are many questions still to be answered regarding the effect of Vitamin D on invertebrates. For this experiment, first-instar larvae maggots will be subjected to both high and low concentrations of ergocalciferol. Using Acetone as a carrier, a less than lethal dose will be established by a 96 Hour Toxicity Test on Daphnia with varying concentrations of ergocalciferol. This will provide the concentration for administration to the maggots. The physical state of the maggots will then be observed to determine the effects of Vitamin D2 on this specific invertebrate.

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Project Number: SBI058

Grade: 11

Title: When is a Leech a Leech?

Abstract: The problem was to determine the effect of everyday substance, both natural and manmade, to attempt to make an effective leech repellent. Procedure-Beakers were filled with water and leeches in them, beakers numbered 1-6 had two leeches in it. Beakers numbered 8-17 had two leeches. Then a multitude of substances were added to the beakers with water, including orange juice, lemon juice, pickle juice, cologne, eucalyptus oil, insect repellent with 40% DEET, dish soap, and iodized salt. I then recorded the reaction of the leeches. Data- The data had been placed into tables and described based on their reaction. These reactions were placed into three categories and then the percent of each of the categories per substance were placed in pie charts. Conclusion- The conclusion supported the hypothesis with the natural substances showing that the lemon juice had been the most effective, but disproved the hypothesis showing that the manmade dish soap had been the most effective.

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Project Number: SCH001

Grade: 9

Title: Development of an Eco-Friendly Gum Removal Method

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

Project Number: SCH002

Grade: 11

Title: Analyzing the Briggs Rauscher Reaction with Computer Analysis

Abstract: The purpose of the experiment was to expand my understanding of Chemistry and oscillating reactions. In the process of the actual experiment, I initiated the Briggs Rauscher Reaction and analyzed the mechanics of the reaction with a computer program called Scratch that sensed the amount of light going through the solution in terms of ohms. The data received through this process was formed into a graph (time vs. light). Thus, I was able to draw the conclusion that when the temperature of the reaction is increased, the reaction moves much faster, but when the temperature is decreased, the reaction moves much slower.

Project Number: SCH003

Grade: 9

Title: Light Bright

Abstract: The purpose of this experiment was to determine if the light source that a glow in the dark object was exposed to effected how brightly it glowed. The light sources that were tested were incandescent, halogen, sunlight, darkness, and LED light. Each glow in the dark object was exposed to each light source for three hours then was measured using a light measuring device. The objects exposed to halogen and sunlight had a brightness of .78 LUX, darkness was .58 LUX, LED was .72 LUX, and incandescent .70 LUX. The results were that the objects exposed to both sunlight and halogen glowed the brightest.

Project Number: SCH004

Grade: 11

Title: Effectiveness of Ant-acids

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

Project Number: SCH005

Grade: 9

Title: Electrolyte Effect in Fuel Cells

Abstract: Hydrogen fuel cells are an environmentally friendly source of energy. My experiment tested how different electrolytes impacted the voltage output of a fuel cell. I also tested if the pH of the electrolyte affected the output. For my experiment, I built a fuel cell and changed the type of fluid used as the electrolyte. For each trial, I measured the output voltage of the fuel cell. I compared the pH of the electrolyte to the output voltage. I found that the electrolytes I tested having the highest pHs had greater output voltages than the electrolytes having lower pHs.

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Project Number: SCH006

Grade: 10

Title: Nitrite Retention Chemistry

Abstract: Activated carbon is a readily available, low-value material that could be added to fertilizers or soil to reduce nitrate nitrogen (NO₃-N) runoff to surface and near surface ground water. Gypsum, sand, carbon, iron filings, animal litter, coffee and vermiculite were comparatively evaluated, using an ion selective electrode, to show that only activated carbon adsorbs nitrate. A linear adsorption isotherm was observed ($r^2 = 0.975$) over the dosing range 0.77-6.1 mg NO₃-N/g carbon. The adsorption capacity observed using neat standards was 0.70 mg NO₃-N/g carbon, while the adsorption capacity for mixtures of activated carbon and cow manure was 0.47 mg NO₃-N/g carbon.

Project Number: SCH007

Grade: 10

Title: Car Aerodynamics

Abstract: The purpose of this experiment is to find what creates a car's drag and how to improve it. A random selection of cars will be placed in a Plexiglas box with a hole in the front and back as well as a ruler to measure the size of the drag. Smoke will then be introduced in one end of the box while a vacuum cleaner sucks it over the car and out the back. The size of the drag will be recorded in inches as well as how fast the vacuum sucked the smoke out in mph. The results will then be taken into account to build a better car, reducing the drag by five percent or more. Research is still being conducted. Final abstract will be available at my exhibit on Fair Day.

Project Number: SCH008

Grade: 11

Title: Got Acid?

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

Project Number: SCH009

Grade: 11

Title: Economic Methods of Silver Production (EMSP)

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

Project Number: SCH010

Grade: 11

Title: Keeping It Fresh

Abstract: The purpose of this experiment was to determine which type of container keeps food freshest in the refrigerator. Different types of plastic storage bags as well as a plastic storage container were tested.

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Project Number: SCH011

Grade: 9

Title: Wood Finishes and Wood Burning

Abstract: Finishes have been used in wood working for many centuries. A finish describes a type of coating that is put over a piece of wood to seal/protect the wood. Six different finishes and a control were tested to determine how the finish effected the burning time of the wood sample. The data showed that finishes with higher oil content, such as shellac, decreased the burn time. All finishes that I tested caused a decrease in burn time, but those with higher oil content decreased the time. Statistical analysis showed that the data in this experiment were due to chance.

Project Number: SCH012

Grade: 12

Title: green machine 2.0

Abstract: My problem is can you make a synthetic form of Phosphophyllite? Also if I can get all of the right materials for my project such as iron phosphate and manganese zinc. Now my real problem was actually making or getting iron phosphate which you cannot buy and it is still hard to make so I took iron oxide and sodium phosphate and dissolved them together hoping to get a red color meaning I got iron phosphate I did so and got a rust kind of color I was just thinking it might be this color because my iron oxide was black iron oxide so I figured I may have got it. So once all of that was done I took my mixture of whatever I got hopefully iron phosphate but I took it and mixed it with my other mixture of manganese and zinc and then the waiting begins but before that I have to put it in a compressed area to pressurize it then I have to wait to see if it begins to form. In that time I am going to another test of making the two mixtures and putting them in a heated area and see if that works and while that is going on I'm going to put a mixture in a clay bowl because it really draws all the chemicals together to form hopefully. The data I have collected is how much of each chemical do I need so I need 3.5g of iron phosphate, 2.9g of zinc, 1.3g of manganese and 3.0g H₂O. So in conclusion I have to see if it is possible to make this crystal if not what went wrong? Then if it does form in which test did it form in. but my research is still being conducted. Final **Abstract** will be available at my exhibit on fair day thank you for your time.

Project Number: SCH013

Grade: 10

Title: Can You Change Clothings Flame Retardance?

Abstract: The purpose of this experiment was to determine if I could affect the flame retardance of clothing. To test this I timed how long it took for a T-shirt to ignite and burn, after it had been sprayed with flame retardant spray. In my experiment I tested a homemade solution and a store bought spray. The store bought brand worked better, thus proving my original hypothesis correct, that the store bought brand would work the best in my testing environment. These results could be beneficial to everyone, allowing them to make their clothing more flame retardant and safer.

Project Number: SCH014

Grade: 9

Title: Vitamin C

Abstract: Some doctors recommend people add more vitamin C to their diet. If the person prefers not to take pills, then they must find a juice that meets all of their diet needs. The main purpose of this investigation was to determine whether or not vitamin C levels stay consistent

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between different brands of juice. Using a burette, orange juice was titrated until the final endpoint was reached. Data collected thus far shows a difference in brands of orange juice and levels of vitamin C.

Project Number: SCH015

Grade: 11

Title: Home Remedies for Ink Stain Removal

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

Project Number: SCH016

Grade: 12

Title: Green Fuel

Abstract: The use of vegetable oils for biodiesel production has ignited the food versus fuel debate and temporarily stunted biodiesel research. Biodiesel is a safer alternative to diesel, significantly decreases air pollution, and better lubricates the engine. Biodiesel's primary disadvantage is its poor cold weather performance. The experiment creates biodiesel from two non-edible oils, jatropha curcas and pongamia pinnata, and measures the cold weather performance through determining the cloud and gel points. Jatropha biodiesel provides the solution to both of the mentioned problems: it eliminates competition between the food and fuel industries and has good cold weather performance.

Project Number: SCH017

Grade: 10

Title: Burning Fabrics

Abstract: The purpose of this experiment is to see which fabric is naturally the most flame retardant. The procedures for this experiment are to cut out three ten by ten centimeter pieces of each type of material. Hold the flame twenty centimeters away from the fabric. Start the timer as soon as the flame is placed under the fabric. Record when the flame catches on fire and when the fabric is completely gone. Repeat for all fabric pieces. In conclusion the fabric that is the least flame retardant out of cotton, nylon, rayon, polyester, flannel cotton, and silk is nylon.

Project Number: SCH018

Grade: 11

Title: Sapphire Redox

Abstract: The problem I'm addressing is to be able to make a yellow, blue, red and purple sapphire by heating a mixture of aluminum oxide with either iron oxide, titanium dioxide, chromium oxide or vanadium oxide. Research is still being conducted. Final abstract will be available at my exhibit on Fair Day.

Project Number: SCH019

Grade: 11

Title: Let It Not Be Lead

Abstract: Lead has been recognized as a harmful pollutant which can lead to a variety of adverse health effects. There are several products, which are highly leaded, present in the market, especially toys and jewelry. As a result, many home lead testing kits are available, as

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well as lab tests. In my experiment, I wanted to find the optimum conditions to test lead at home, and to see whether home kits are reliable by comparing its' data to a spectrophotometer's data. I found that a higher temperature and acidic solution are the best testing conditions. Also, I observed that home testing kits are not very reliable; although they show the presence of lead, they don't relay the accurate amount of lead present.

Project Number: SCH020

Grade: 9

Title: Does a battery at high temperature last longer than one at a low temperature?

Abstract: The purpose of this project was to determine whether or not temperature had an effect on the performance of batteries. Batteries were placed in a flashlight and were heated or cooled to a variety of temperatures. The length of time it took for the flashlight to fail to shine was recorded for each of the tested temperatures.

Project Number: SCH021

Grade: 9

Title: Hidden Hazards: Phthalates in Microwaved Liquids

Abstract: Plastic containers are widely used in microwave cooking. There is concern that heating plastics not specifically tested and approved for microwave use, can leach harmful chemicals into food. In spite of this, many consumers do indeed use non-approved containers in the microwave. The purpose of this study was to determine if chemicals leach from plastic containers into liquid upon microwaving. Vinegar samples were microwaved in non-plastic, approved plastic, and non-approved plastic containers and were compared to control with spectrophotometry and MS/GC. Non-plastic (ie, glass, ceramic,) containers did not differ statistically from control, but both non-approved and approved plastics did.

Project Number: SCH022

Grade: 12

Title: Crystal Metamorphosis

Abstract: The purpose of experimentation was to see how various factors would affect crystal growth. A standard method to produce the crystals was set as a control. Once the standard method is determined, the various factors were applied, like cooling rate and solution strength to the standard method to see the difference in size, amount, etc., of crystals. Results showed decrease in crystals but increase in size for cooling rate, while increase in amount for solution strength. Conclusion was concentration and cooling rate significantly alter crystal growth.

Project Number: SCH023

Grade: 9

Title: Liquid Light

Abstract: The purpose of the project is to test how temperature affects the light intensity of a light stick. First, I filled a glass container with hot water, another with cold water, and a third with tap water. Then measured temperatures of water in the containers, put the sticks in the containers and observed. I did this every twenty minutes for sixty minutes and then found results. The results were that the light sticks grew brightest in the hot water. In conclusion, this happened because the chemical reaction in the light stick sped up causing the light stick to become brighter.

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Project Number: SCH024

Grade: 11

Title: The Whitening Effect

Abstract: The purpose of this experiment was to determine if the hydrogen peroxide in whitening products damage tooth enamel. Ten cow's teeth were weighed before and after they were soaked to determine the weight loss of enamel. Molar 1 and incisor 1 were soaked in the 3% solution and lost no weight, which showed the least enamel damage. Molar 5 and incisor 5 were soaked in the 14% solution; molar 5 lost .008g and incisor 5 lost .011g which showed the greatest enamel damage. The hypothesis was supported; the hydrogen peroxide caused weight loss in all teeth excluding group one.

Project Number: SCH026

Grade: 12

Title: Do different varieties of apples have the same level of vitamin C?

Abstract: The purpose of this project was to determine if different varieties of apples contain significantly different amounts of vitamin C. An iodine-cornstarch solution was used to determine the relative amounts of vitamin C in a variety of different types of apples. There were no significant differences in the amount of vitamin C found in each.

Project Number: SCH027

Grade: 11

Title: Which Orange Juice Has the Most Vitamin C?

Abstract: We are all told that vitamin C is necessity in our everyday diets. Orange juice is rich in vitamin C and can help you in everyday life, but which orange juice out of all the different kinds is most enriched by vitamin C? I am testing these different kinds of orange juices by using the method of titration to find which is infused with the most vitamin C. According to my hypothesis, I predict the freshly squeezed orange juice will have the most vitamin C. Final **Abstract** will be available at my exhibit on Fair Day.

Project Number: SCH028

Grade: 10

Title: Is the effectiveness suntan lotion the same among different brands and SPF

Abstract: The purpose of this experiment was to determine if suntan lotion from different brands with the same SPF have the same effectiveness as each other. The procedures for this experiment I performed included laying a clear report cover onto a piece of undeveloped photography paper and then applying four different brands of suntan lotion with the same SPF onto the report cover. The coated clear report cover and photographic paper was then placed in the sun for three different time durations. Research is still being conducted. Final **Abstract** will be available at my exhibit on Fair Day

Project Number: SCH029

Grade: 11

Title: Effect of substrate on MFC output

Abstract: The purpose of this experiment is to see whether fermentable or non-fermentable substrates would perform better in producing electricity in a microbial fuel cell (MFC) which converts sludge to electricity. Two MFC batch-reactors were constructed, with one fed acetate (a non-fermentable by-product of fermentation) while the other was fed glucose (fermentable).

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The reactors ran over a week, with data collected through cyclical voltammetry. The results showed that non-fermentable substrates were slightly better than their fermentable counterparts. The applications for this research are tremendous and virtually any facility employing sludge MFCs, the most common type, could use the results.

Project Number: SCH030

Grade: 11

Title: Vitamin Content in Potatoes

Abstract: The purpose of this experiment was to determine if boiled potatoes would affect the amount of Vitamin C content, does boiled or steamed potatoes decrease the Vitamin C content. The procedure used was to prepare both potatoes, weigh them, and put them into metal pots. Add water to both pots and steam and boil the potatoes. Put the steamed and boiled potatoes into beakers and add iodine mixed with 50ml of boiling water into the beakers. Take the squared ml of iodine and subtract 0.5 from it. Then also multiply that answer by 0.1 and multiply that answer by 88. When you are done with that divide the answer by weight of potatoes. The results were that the boiled potato had less Vitamin C content than the steamed potato. The conclusion is that the boiled potato's Vitamin C content decreased, as predicted, and the content was higher in the steamed potato.

Project Number: SCH031

Grade: 10

Title: Ammonia Levels in Manure

Abstract: This experiment determined if different kinds of bedding for cows changed the ammonia levels emitted. The manure and different bedding were placed in 1 liter jugs and allowed to ferment for two days. An ammonia gas detector, rented from Industrial Scientific, measured the levels of ammonia gas emitted. Data to this point showed that the corn husk bedding controls the ammonia levels best when compared to the other beddings that were used.

Project Number: SCH032

Grade: 10

Title: Paper Chromatography

Abstract: Permanent markers currently on the market can have different colorants. The experiment that I am going to conduct is to use paper chromatography to determine which marker is the purest. By placing a dot of the marker on the end of the chromatography paper and using rubbing alcohol as the carrying liquid, I can determine which the purest ink is. The ink that has the fewest colors in it has the purest ink. There are no plans for future testing. Final abstract will be available at my exhibit on Fair Day.

Project Number: SCH033

Grade: 11

Title: Photoelectric Effect

Abstract: The purpose of the experiment is to test for correlations between the testing material and the resulting current in photoelectric effect. A 2cm by 4cm metal piece was obtained for copper, zinc, iron, and aluminum. A mirror was silver plated and excess size mask taped. Each metal piece was exposed to black light and a magnetic current detector measured the resulting current. The first ten numbers appeared in Datamate was recorded

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and the procedure was repeated five times. The results of each metal of total fifty numbers were averaged and graphed.

Project Number: SCH034

Grade: 11

Title: Effect of pH on the Maillard Reaction

Abstract: The purpose of this project was to determine whether or not pH has an effect on the Maillard reaction. Different solutions with a wide range of pH were tested on the Maillard reactions for pretzels. It was determined that pH does have an effect with a very narrow range of pH producing the best results.

Project Number: SCH035

Grade: 9

Title: Efficiency of Distillation Desalination for Varying Salinity

Abstract: The purpose was to desalinate water ranging from tap water to seawater through distillation. The distiller was constructed of inexpensive, accessible materials. 1L of each of the salinities was boiled for 30 minutes, and then the amount, temperature, and salinity of the distillate was taken as well as the temperature of the condenser. My data analysis showed that the distiller greatly decreased the salinity regardless of the starting salinity. Also, the water with higher salinities produced more distillate. Using this information, people in rural areas who have salty water could build a distiller for desalination that is effective and efficient.

Project Number: SCH036

Grade: 12

Title: Property and Performance of Detergents

Abstract: This project evaluated the performance of ten liquid laundry detergents. The study showed the comparison property and performance of regular detergent to high performance detergent, which includes emulsifying properties, alkalinity, suds level, behavior in hard water, reaction with mineral acid, and cleanability to remove dirt, oil, and other stains.

Project Number: SCH037

Grade: 10

Title: Factors Affecting the Duration and Intensity of Chemilumines

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

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Project Number: SCM001

Grade: 10

Title: Analysis of Reactive Semantics Extensions

Abstract: By implementing reactive semantics we can divide time into instants when programs react. This will help to preserve determinism and allow concurrency and parallelism. It will help implement a spatio temporal event model.

Project Number: SCM002

Grade: 9

Title: The Digit Product Function

Abstract: Given a two digit number n (in which the first digit is allowed to be zero), in some base b , multiply the digits to obtain a new number. Repeat this process until a value of zero is reached. Output the number of steps it takes to reach zero. (Research is still being conducted. Changes may be made to this abstract between now and exhibit day)

Project Number: SCM003

Grade: 11

Title: The Relationship Between Birth Order and Personality

Abstract: The experiment's purpose is to prove a relationship between birth order and personality. The Big 5 Personality test was distributed to sixty volunteers of ages fifteen to twenty-five. Once tests are completed and collected, the participant's answers are put into the online Big 5 Personality test to be analyzed and ranked by percentiles from zero to 100. The results are further analyzed to determine a relationship. While the data did not show a strong relationship between specific birth orders, the overall data displayed a consistent relationship due to the closeness in age.

Project Number: SCM004

Grade: 10

Title: Comparative Analysis of Automated Learning Methods

Abstract: The objective of this project is to compare two automated learning techniques used in machine learning: supervised learning (active learning) and unsupervised learning (passive learning). Data sets that have been used for unsupervised learning will be taken from an online machine-learning repository*. Then, an initial supervised learning algorithm will be constructed using the partial training data set of unsupervised learning. The rest of the data, from the same training data set, will be used to enhance the supervised learning algorithm. Following this, the recall and precision curves of supervised learning technique will be measured and compared with that of unsupervised learning.

Project Number: SCM005

Grade: 9

Title: Artificial Intelligence and Skatterball

Abstract: Create a flow chart for computer application in conjunction with the Chipmunk physics and Cocos2d graphics libraries to code the application and create an artificial intelligence that can catch a skatterball.

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Project Number: SCM006

Grade: 10

Title: An English to German Translator

Abstract: The goal is to employ rule-based and statistical machine translation techniques, to create an English to German translator. To begin, identify a well-authenticated corpus of English sentences translated into German. Create a basic machine translator by applying statistical methods. Incorporate natural language processes and finally evaluate the accuracy of the translator over a body of sentences with known translations.

Project Number: SCM007

Grade: 12

Title: Ocean Metagenome Phylogenetics

Abstract: The purpose of my project was to determine if there are significant differences between classes of proteins in a family (phosphate-binding transport, pstS) and to find the structural pattern of sequence residues that communicate information among various parts of a 3D protein structure. I utilized programs from the Pittsburgh Supercomputing Center to align sequences and analyze data. The data was amino acid sequences from the iProClass protein family database. My results suggested that there is only one group of pstS proteins in bacteria, and that the allosteric mechanism activating it is pressure transferred throughout the molecule by a bound phosphate.

Project Number: SCM008

Grade: 10

Title: Remote Acquisition and Distribution of Oceanographic Data

Abstract: The U.S. National Oceanic Administration estimates that only five percent of the ocean has been mapped and an even smaller percent of the ocean floor has been explored. Successful ocean exploration and commerce depend on availability of accurate data about the ocean. The goal of my project is to design and develop a system to remotely collect data on bodies of water, transmit and process the data, and explore methods of distribution of such data. I will do so by engineering automated machines, transmitting collected data, and writing algorithms for necessary analysis and communication of results.

Project Number: SCM009

Grade: 12

Title: Genetically Generating AI

Abstract: Artificial intelligence is a crucial part of modern software, yet in many situations it can be very difficult to develop directly. This project examines another approach: defining small, simple snippets of code that might be useful, and then combining them in a variety of ways--simulating biological breeding and natural selection--to create a much more complex algorithm. Though the project uses this genetically programmed AI for a trivial purpose--playing tic-tac-toe--the results will hopefully provide insight into the feasibility of using this technique in more complicated scenarios. The project is still being developed as of January.

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Project Number: SCM010

Grade: 11

Title: Optimization of F(x) Functions with Genetic Algor

Abstract: Given a set of points on a graph, can a computer accurately find a practical mathematical function through the use of a genetic algorithm without any prior knowledge of what function that set of points may resemble? The goal of this experiment was to create a program that is optimally able to fit a curve in terms of accuracy and speed.

Project Number: SCM011

Grade: 11

Title: Optimal Keyboard for Disabled

Abstract: Disabled people who cannot speak or use their hands have an extremely difficult time communicating. There are assistive communication devices that the user can type on by hitting a switch as keys are highlighted sequentially. That process can be tedious. In this project word prediction software was written along with a simulation of the process of typing using single switch scanning. Software was written to find the optimal key layout for the 20,000 most common words. For three different keyboard types, QWERTY, T9, and a commercially available device, an optimized keyboard layout was found that performs better than the standard keyboards.

Project Number: SCM012

Grade: 9

Title: How Digital Electronics Keep Time

Abstract: The purpose of my experiment was to build a binary clock to represent how digital electronics recognize time, compared to how we understand time. Computers and other digital electronics cannot recognize time or the decimal system. The procedure for this experiment was to design, build and test the following circuits: power, clocking, and counting. The counting circuit is made up of the second, minute, and hour circuits.

Project Number: SCM013

Grade: 9

Title: Grammatical Analysis by Computer

Abstract: My goal is to produce a program that can recognize grammatical patterns given a database of words. In addition to recognizing grammatical patterns, the program should also be able to recognize conjugations of a verb, or recognize plural nouns. This would have many applications in the real world, such as improving grammar checkers, or obtaining meaning from sentences. I do not expect to achieve this much. I hope to complete the core of the program, the code that decides what each word is, so that it could in the future be used for such purposes.

Project Number: SCM014

Grade: 12

Title: IrisScribe Eye Typing Interface

Abstract: In a hospital ICU, good doctor-patient communication is essential. However, medical conditions and devices often inhibit a patient's speech. This project, IrisScribe, is a software solution that bridges this communication gap. The program detects the direction of the patient's gaze. The patient thus interacts with a graphical menu via eye movements, and

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can generate text from an ambiguous keyboard or a list of common phrases. The program can process an image in 200ms, and a patient can type a simple phrase in about 1 minute. As it runs on existing equipment, IrisScribe offers an effective, low-cost solution to ICU communication.

Project Number: SCM015

Grade: 10

Title: Is Seam Carving More Effective Than Classic Image Resizing?

Abstract: For my project, I am constructing an algorithm to resize images to create a more refined, effective image. After I construct the algorithm, I will survey individuals to get their feedback as to their preferences towards my algorithm and whether the algorithm fulfilled its purpose or not. This algorithm, known as seam carving creates a more effective way to resize images. Once I had a working algorithm, I expanded on it to enlarge images, and customizable options that allow the user to select specific regions to be preserved or removed.

Project Number: SCM016

Grade: 11

Title: Bijections, Extensions, and Posets

Abstract: A partially ordered set is a set equipped with a relation which is transitive, reflexive, and antisymmetric. In 1981, Richard Stanley asked for an explicit bijection (a function which is one-to-one and onto) from the “Jordan-Hölder set” of linear extensions ($L(P)$) of a naturally labeled poset to itself using combinatorial methods and satisfying certain properties. I provide a solution for a special case: when the poset in question is also the product of two chains (i.e. totally ordered sets). I apply the “transformation sequence” of the rank form to create a bijective algorithm satisfying the given parameters.

Project Number: SCM017

Grade: 12

Title: Binary Conversion

Abstract: The purpose of this experiment is to determine if a JavaScript program can convert numbers between their binary, decimal and hexadecimal representations. I had to learn the basics of creating a JavaScript program. I also had to review basic HTML terms.

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Project Number: SES001

Grade: 11

Title: Effects of Drilling on Cross Creek

Abstract: Determine if Marcellus Shale drilling had an effect on Cross Creek water quality. Take samples from six places on stream over four months and test for total dissolved solids, bacteria, strontium, barium, chloride, pH and aquatic life.

Project Number: SES002

Grade: 11

Title: Effect of Turbidity on Effectiveness of UV Disinfection

Abstract: This project tried to determine any correlation between turbidity and UV disinfection. Samples were taken from a water treatment plant and were tested for turbidity and UV disinfection. A slight correlation was found between the two. Samples with a higher turbidity tended to contain higher levels of E. coli. The findings supported the hypothesis of this experiment.

Project Number: SES003

Grade: 9

Title: Addicted to Oxygen

Abstract: Did you know air pollution is all around? It is. This experiment was to figure out which location had the highest level of air pollution. Seven “catchers” were hung at seven different locations. A week after being hung, they were taken down, recorded, and different statistics were placed on each one. It was determined that the one hung at the Montour Trail located in Clairton, PA 15025 had the most air particles caught. Location suggests that this “catcher” had the most particles on it due to its close range to the Clairton Works Steel Mill.

Project Number: SES004

Grade: 12

Title: A Stinky Situation

Abstract: The stink bug has become a problem in the United States today, not for being harmful or life-threatening, but for being a nuisance that is impossible to get rid of for good. Research is still being conducted. Final abstract will be available at my exhibit on Fair Day.

Project Number: SES005

Grade: 12

Title: Gardening Away Garbage

Abstract: Keeping the environment clean is one of the biggest concerns in our world today. Eliminating food waste is one way of easing this damage. For my project, I collected potato peels, banana peels, and coffee grounds and used them as plant fertilizers. Over a series of 6 weeks, I added 1 gram of each substance to a pea plant and measured the growth weekly. After the 6 weeks, no significant growth was noted from using the different substances.

Project Number: SES006

Grade: 12

Title: Little Buffalo Creek Testing

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Abstract: The purpose of my experiment is to find out if the Little Buffalo Creek is being polluted by a local company, Harsco Mineral, and their drainage ponds. I will conduct a macro invertebrate survey using leaf packs. I will test the water from the Little Buffalo Creek and drainage ponds by doing a chemical analysis using LaMotte kits. I will then use daphnia and amphipods in a 96 hour toxicity test with the water collected upstream, downstream, and right across from the possibly polluted drainage pond and dilute the water if necessary for life.

Project Number: SES008

Grade: 10

Title: Tsunami Defense

Abstract: Tsunamis are powerful waves that cause massive destruction on unprotected shorelines. Small scale models of two different coastal areas will determine the difference between a tsunami impact on a harbor versus their impact on a straight coastline, and which defense mechanisms work better for each. Data is still being collected on whether or not offshore or shoreline defenses are better for reducing the impact when they hit land. The devices tested will vary from nature's defense, plants, to man-made walls and gates to determine which mechanisms work better in providing defense of coastline.

Project Number: SES009

Grade: 9

Title: The Effect of a Lime Doser on Benthic Macroinvertebrates

Abstract: Lime dosers are used to improve water quality in streams, but the sediment they produce may negatively affect benthic macroinvertebrates. This experiment examined how benthic macroinvertebrates were affected by a lime doser. Kick samples were collected three times at seven locations above and below the lime doser. The number of benthic macroinvertebrates didn't decrease immediately below the lime doser and was higher at all downstream sampling points than above the lime doser. The percentage of species indicative of healthy streams was highest immediately below the lime doser. Benthic macroinvertebrates appeared to be less affected by the lime doser but more by the substrate.

Project Number: SES010

Grade: 12

Title: Are Sunchips Bags Decomposable?

Abstract: The world is all about going green. I wanted to test if the "biodegradable" Sun Chips bags were actually decomposable. A total of 28 2x2 inch pieces of Sun Chips bags were buried in 28 different flower pots. 14 pots were kept at room temperature and the remaining 14 were kept in an incubator at 100° Celsius. This was done for a total of 8 weeks. At the end of the 8 weeks, nothing had happened to any of the Sun Chips bags.

Project Number: SES011

Grade: 12

Title: Hydroponics vs. Soil

Abstract: When a person thinks of gardening they think about planting with soil, but there is another way! Hydroponics is an as efficient and much cleaner way to garden. For my project I tested Hydroponic solution and soil to see which was better. I tested pea seeds in both hydroponics and soil (10 pots each). After 6 weeks hydroponics showed no results. After testing, hydroponics didn't work within the experiment.

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Project Number: SES012

Grade: 10

Title: What is the Effect of Land Management on White Tailed Deer Population

Abstract: This experiment has concluded that the agriculture land management had the highest deer population, Big Savage Wildlands had the second highest population, the Savage River State Forest had the third highest population, Urban Park had the fourth highest population, and Dan's Mountain WMA had the fifth. To estimate the amount of deer sign in an area first lay out a 100 meter measuring tape from a predetermined starting point in a set direction, search 1 meter on either side of measuring tape, Record the data, Repeat three times at each land management site. The hypothesis was not supported

Project Number: SES013

Grade: 11

Title: Heavy Metals and Aquatic Environments

Abstract: This experiment was performed to see how heavy metals from pollution affect aquatic life. To begin, six one-gallon containers were filled with different amounts of liquid copper, from 0 ppm to 1.0 ppm. The copper solution was then poured into six-cup containers and two plants and one snail were added to each container. The reactions of the organisms were recorded until no organisms were living. The containers with high amounts of copper solution had negative results faster than the others, but all containers with copper solution had negative results. Therefore, any amount of metals in water pollution is dangerous for organisms.

Project Number: SES014

Grade: 12

Title: The Concentration of Selenium in Zebra Mussels

Abstract: This research found that the concentration of Selenium in zebra mussels downstream from a combustion waste impoundment known to be leaching toxic elements into the Ohio River was greater than the concentration of selenium in upstream samples. The objectives were to determine that zebra mussels could be found in the river system, to test the mussels for selenium concentration, and to see if the results were consistent with toxic concentrations of similar elements found in other aquatic species in other places in the Ohio River Valley. Two sites were selected along the Ohio River; the upstream site was located in Sewickley, PA and the downstream site was located in Georgetown, PA next to the Little Blue ash impoundment. The hypothesis tested was that Selenium concentrations in the zebra mussel tissue would be greater at the downstream site near Little Blue. The mussels were collected and preserved. The tissue was removed from the individuals, digested in nitric acid, and concentration levels determined by using Inductively Couple Plasma Spectroscopy. The hypothesis was supported by the experimental data. Further, this results extend the research that has been done on coal waste impacts on aquatic species by finding selenium which had not been previously analyzed in the Ohio River and by finding coal waste impacts in mussels which had not been studied in this portion of the Ohio River Valley.

Project Number: SES015

Grade: 11

Title: Dirty Turbidity

Abstract: In this experiment I found that where there were high levels of high human activity there was a higher turbidity rate. I discovered this by finding a place on Deep Creek Lake

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where there was nothing but forest around and the turbidity there was 3 meters which is much better than the 2.08 meters at a place where there was high human activity. The hypothesis was proven even farther as I went to a play area (2m), state park (2m), construction area (1.9m), river entrance (3m), Business area (2.16m), and Bridge (1.97m).

Project Number: SES016

Grade: 11

Title: P and N Limiting Factors

Abstract: Snails (*Physa acuta*) respond to different levels of phosphorus and nitrogen in their food source. Periphyton will be grown in sandwich sized plastic containers on non-glazed ceramic tiles. Units will be set up as follows: High P, control P, Low P, High N, control N, Low N, High P/ Low N, and Low P/ High N. KH_2PO_4 and NaNO_3 are the sources for P and N. The growth rate as identified by shell length, girth, and mass will be recorded for comparison. All data will be assessed with statistical analysis (ANOVA) using computer program MiniTab®.

Project Number: SES017

Grade: 11

Title: Does Frack H₂O Neg Aff Daphni & Plant

Abstract: The purpose of my experiment was to determine the effect of brine/frack water on the heart rate of daphnia and the growth of Rye grass. After preparing different concentrations of brine/frack water I tested the effect of each concentration on the heart rate of *Daphnia magna* and the growth of Rye grass over a period of 30 days. From the data I collected I found that as the concentration of brine/frack water increased the daphnia's heart rate increased and the growth of the Rye grass decreased.

Project Number: SES018

Grade: 11

Title: Is It possible to make Geodes at home?

Abstract: The purpose I am doing this experiment is to see if I can made geodes at home. So I got Epsom salt and mixed it with two cups of water until no more can dissolve. Then I got egg shells and cut them in halves and put the Epsom salt in them and put coloring dyes to give it color. After a couple days it began to crystallize. I've found out that it is possible to make a substitute for geodes at home.

Project Number: SES019

Grade: 9

Title: Which grass overwinters best?

Abstract: This experiment determined which grass variety lasts best after being grown in moderate weather indoors, and then moved to the cold weather outside. Benefits of this experiment include choosing the best grass variety that would "over winter". Four different grass seed varieties were grown indoors. After the grass was fully grown, data were recorded and the grass was put outside. After a week, the grass was brought inside to record the area, color, and length again. The data thus far shows that the Penn State mix grass has the best appearance. Further analysis of data may show more results.

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Project Number: SES020

Grade: 9

Title: Effect of Free Radicals/Antioxidants on Seed Germination

Abstract: The objective of my experimentation is to determine whether germination rates are fluctuated due to the damage caused to radish seeds through ultraviolet radiation and the possible reversal effects of blueberry, green tea, and whites of orange rinds as antioxidants. This is to simulate the depletion of the ozone layer and to find a way to shield organisms, with antioxidants as the protective agent. Germination tests were erected with slurries of antioxidant substances used as moisture to the irradiated seeds over a period of 14 days. Experimentation is still underway and there isn't currently enough data to conclude all results.

Project Number: SES021

Grade: 11

Title: Fire or Fiction

Abstract: The objective of this project is to determine which method of fire starting is the fastest and most effective without using a match or a lighter. It is hypothesized that the method using a magnesium flint will start a fire fastest and most effectively without using a match or lighter. The methods used in this project were the hand drill, bow drill, magnifying glass, magnesium flint, and steel wool and a battery. The results showed that the method using steel wool and a battery was the fastest and most effective way to start a fire without using a match.

Project Number: SES022

Grade: 10

Title: Algae and Acid Mine Drainage

Abstract: If the pH of an acid mine drainage water sample is neutralized using algae will the neutralized water sample be able to sustain life? There are many people questioning the mining process due to the acidic damage that occurs in rivers and streams. Samples of the water that were neutralized with algae and filtered with limestone were tested to determine if the algae reversed the harmful effects of acid mine drainage. I tested the waters ability to sustain life and the turbidity of the water after being neutralized. The results determined whether the effects of acid mine drainage can be reversed.

Project Number: SES023

Grade: 9

Title: Soil Remediation Techniques

Abstract: Soil pollution is destructive to ecosystems. The purpose of this project was to test three types of remediation techniques on copper sulfate polluted soil that could prevent copper sulfate from reaching the soil's groundwater. Four boxes were arranged with different techniques; phytoremediation, mycoremediation, adding compost rich in nutrients, and the control. It was discovered that mycoremediation was the best technique, then phytoremediation, and last adding compost. The compost box fared significantly worse than the control, thus this data should be verified. This proves that mycoremediation is the most effective technique on polluted soil in preventing copper sulfate from contaminating groundwater.

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Project Number: SES024

Grade: 11

Title: Shooting For Clean Soils

Abstract: In this experiment the hypothesis stated that bullets fired at a gun range would contaminate the local soils. The hypothesis was somewhat supported by the data. Fifteen samples were taken at and around the gun range varying in distances. The samples were tested for lead and four of the fifteen samples were considered to be lead contaminated. The samples were measured in parts per million and the results varied from eight ppm to 4050 ppm. The data supported the hypothesis stating that lead projectiles have the potential to contaminate the local soils to dangerous levels.

Project Number: SES025

Grade: 9

Title: Lead in Local Soil and Water

Abstract: I have noticed that one of the topics on the news was about lead contamination and the effects it can have on children. The purpose of this investigation is to determine where there is a high level of lead in local soil and water. What location has the most amount of lead? Two water samples were taken from two different locations, and three samples of soil were taken from five locations. Each sample was tested three times. After they were tested a data table was made and then the data table was converted into a bar graph. There was no lead found in the water, but moderately high amounts were found in the soil.

Project Number: SES026

Grade: 10

Title: Mangrove Trees Versus Man

Abstract: In the experiment, Mangrove Trees versus Man, the amount of oil that a mangrove tree can take in and still survive will be tested. Mangrove Plants will be placed in salt water with various amounts of oil to test how much oil they can withstand and still survive. Pictures will be taken of the plants regularly to show the progression of their life while being submerged in water that has been saturated with oil. The motor oil used to conduct the experiment will be disposed of at the automotive shop, "The Garage," located on Broad Street in Pittsburgh, Pennsylvania 15206.

Project Number: SES027

Grade: 9

Title: Wastewater Effects on Algae

Abstract: Marcellus Shale has been in the news frequently lately. My project intended to determine if there was a significant increase in the rate of photosynthesis for algae after being introduced to the Marcellus Shale Wastewater. Dissolved oxygen content was recorded for each of the 25 samples. It was determined that in some concentrations of Marcellus Shale Wastewater there was a significant increase in rate of photosynthesis. This is indication of the beginning of an algal bloom, as literature suggests. This applies to if illegal dumping of wastewater could cause an algal bloom in the environment.

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Project Number: SES028

Grade: 12

Title: BPA-Not Gone Yet

Abstract: The purpose of my experiment is to discover the effects of three common chemicals in combination with Bisphenol A found in natural water on the death rate of Daphnia magna. 8 daphnia were exposed to 3 groups, a synergy group consisting of the 3 chemicals, BPA and yeast, a BPA and yeast group, and a yeast group. The experiment was repeated 6 times each for 5 different BPA levels. After analyzing the data, I discovered that the synergy group had no significant effect on the mortality rate of daphnia in comparison to the effects of BPA alone. The purpose of my experiment is to discover the effects of three common chemicals in combination with Bisphenol A found in natural water on the death rate of Daphnia magna. 8 daphnia were exposed to 3 groups, a synergy group consisting of the 3 chemicals, BPA and yeast, a BPA and yeast group, and a yeast group. The experiment was repeated 6 times each for 5 different BPA levels. After analyzing the data, I discovered that the synergy group had no significant effect on the mortality rate of daphnia in comparison to the effects of BPA alone.

Project Number: SES029

Grade: 10

Title: Effect of Airfoil Shape Changes on Lift and Drag

Abstract: The following shapes: ellipse, plate, cylinder, and ball were used in this study. These shapes were entered into NASA's Foil Sim III Flight software package to determine the most appropriate airfoil shape for sustaining flight. For each shape, the angle of degree, camber, and thickness was varied to determine the lift (l), drag (d), and lift to drag ratio (l: d). The angle of degree camber and thickness were varied until an optimal lift to drag ratio was determined. Once an optimal lift to drag ratio was determined for each shape, the shapes were compared in order determine which shape was best for sustaining flight.

Project Number: SES030

Grade: 10

Title: Can aquatic plants remove arsenic from fly ash deposits?

Abstract: The purpose of my experiment was to determine if aquatic plants have the ability to remove arsenic from the water drainage from fly ash deposits. To test this, I chose three aquatic plants, water lettuce, water hyacinth, and water celery, and placed them in separate tubs containing water that was previously soaked with fly ash. I then tested this water's arsenic concentration every 30 minutes for 8 hours. I found that the water lettuce removed a bit more arsenic than water hyacinth and water celery. This data supported my hypothesis.

Project Number: SES031

Grade: 10

Title: Salinity and Oil Mycoremediation

Abstract: My experiment determined the effect of salinity on mycoremediation or the removal of environmental pollutants by fungi. Specifically, I evaluated the effect of various concentrations of water salinity on the remediation of diesel oil by the Oyster Mushroom. I placed a constant amount of mushroom mycelium, sawdust, and diesel oil in two control trays misted with spring water and four experimental trays each misted with a different saltwater concentration representative of various aquatic environments. Analysis was performed using a Multi-well Plate Reader. My results supported my hypothesis that as the concentration of salt in the water was increased, the effectiveness of mycoremediation would decrease.

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Project Number: SES032

Grade: 12

Title: Determining the Observation Limits of the R-COP Telescope

Abstract: In 2008 a robotic telescope from the Remote Telescope Partnership between Clarion University's Science in Motion, the Oil Region Astronomical Society and Perth Observatory (R-COP Telescope) became operational. This facility is intended for educators and their students to conduct simple research and gain real-life science experiences. However, to date the telescope is poorly used and by establishing a User's Manual the facility should become more accessible and attract more teachers to make use of it. This paper discusses limitations of the R-COP Telescope, such as the field of view, tracking, and exposure limits that are ultimately an essential part of the User's Manual.

Project Number: SES033

Grade: 11

Title: Water Testing: What Are We Drinking

Abstract: Today, a variety of water bottles all offer the "purest" water. This experiment was conducted to test the purity of the water through their bacteria levels. To conduct this experiment, the student will pipette an equal amount of the water from each bottle onto separate agar plates. The plates will be left at room temperature, an average water bottle temperature. After 24 and 48 hours the bacteria colonies will be measured. The process will be repeated again after one week of opening the bottles. The experiment is still being conducted; please stop by the experimenter's project for final abstract.

Project Number: SES034

Grade: 11

Title: Biodegradable Sun Chip Bags

Abstract: The purpose of this experiment is was to see which bag deteriorates the most. Weigh four empty Sun Chip Bags. Burry one biodegradable Sun Chip bag in each of the following materials: horse manure with hay and sawdust, dirt, leaves with sticks, grass and leaves, a big jar of water. Take the temperature of each bag once a week with a laser thermometer and record the data. After 12 weeks dig them up and weigh them to see which bag deteriorated the most. None of the bag's mass had changed. The bags will not deteriorate during winter in Pennsylvania.

Project Number: SES035

Grade: 12

Title: Fly Ash's Effect on Ryegrass

Abstract: This experiment's purpose is to determine if different concentrations of fly ash will affect the germination, growth, biomass and uptake of mercury and arsenic in ryegrass. 100 seeds were planted in 0%, 10%, 20%, 30%, and 40% fly ash mixtures. Germination and height were determined daily. After 30 days the plants were dehydrated to determine biomass. Then 50g of the dried plant was mixed with 50mL of water. The water was tested for mercury and arsenic. Trends showed that the plants from the higher concentrations did not grow as well and the amount of heavy metals in the plants increased.

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Project Number: SES036

Grade: 11

Title: Effect of Fertilizer on Aquatic Life

Abstract: Water pollution creates a big affect on our society. It is harmful to both aquatic and terrestrial life forms. One of the biggest types of water pollutants in our society are fertilizers found in runoff water. Fertilizers come in two different forms, organic and synthetic. My experiment is designed to create two ecosystems, an environment in which synthetic fertilizers are found, and an environment in which organic fertilizers are found. I will then add daphnia to these ecosystems and observe the changes, which include reproduction rate and death rate. This project will show which type of fertilizer is safer, organic or synthetic.

Project Number: SES037

Grade: 10

Title: The Best Way to Clean Up An Oil Spill

Abstract: The project in which I conducted is to show the best way to clean up an oil spill. This data can help anyone who has to clean up an oil spill that has occurred on water, big or small. To actually conduct this experiment, I put 60 milliliters of motor oil onto 1 liter of water that was in a plastic tub. I then did three trials for each of my substances – straw as the natural and polypropylene pads as the man-made. After 5 minutes of the product in the oil water solution, I took out the product and measured how much remaining oil and water was left.

Project Number: SES038

Grade: 10

Title: Cancer in Relationship to Mon Valley

Abstract: Cancer frequency with power plants

Project Number: SES039

Grade: 11

Title: The Power of the Wind

Abstract: Harnessing the power of the wind promises to be one of the new "clean" energy sources of the future. In this science fair project, a model of a wind-driven power generator will be built and measure its output. Then obtain data using a laser tachometer (to measure rotor speed) and a multimeter (to measure the electricity produced). This will allow the public to gain first-hand experience in how the energy of the wind is converted into the energy that arrives at homes as electricity. As the results show that the greater the wind speed the greater the voltage output.

Project Number: SES040

Grade: 12

Title: The Effect of Microwaved Water on Plants

Abstract: The purpose of this project "the effect of microwaved water to room temperature water" is to collect data to determine if microwaved water would affect the growth of a plant. Meaning would it grow slower, faster or not at all? My hypothesis was that I thought the microwave water would affect the growth because of the heated chemicals of water to the plant. Tools: 10 plant pots (five pots heated, five pots not), a measured beaker, two bowls (one heated water, one room temp water), a bag of plant seeds. a note book to collect data and a thermometer

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Project Number: SES041

Grade: 11

Title: Aeration and Microbial Communities

Abstract: The purpose of this experiment was to determine how much aeration is needed to minimize the sulfate reducing bacteria (SRB) in impoundments of Marcellus Shale flowback water. An aeration system was set-up with flowrates of oxygen leading to vessels containing flowback water. Samples from the vessels were taken and anaerobic and aerobic bacteria were cultured. I expected to find with increased aeration, an increase in aerobic bacteria and a decrease in anaerobic bacteria. I found that other variables may have an effect on the microbial communities. Future experimentation is planned to test the effect of temperature on SRB.

Project Number: SES042

Grade: 9

Title: Septic Runoff on Algae

Abstract: The purpose was to determine if septic system runoff significantly affects algal population densities in a controlled aquatic environment. Septic concentrations of 0%, 1%, and 4% were added to cultured tubes of Euglena and Chlamydomonas and growth was monitored by spectroscopy for 15 days. Significant negative variations were found in population densities at the following septic fluid concentrations: 1% and 4%. The data showed that with more septic waste there was a correlated reduction in cell population.

Project Number: SES043

Grade: 9

Title: Adhesive & Adhesive Properties

Abstract: The purpose of my experiment was to determine if the adhesive and cohesive properties of water could be used to determine the amount of dish detergent present in water. A 0% (Control) 10%, 20%, 30%, 40%, 50% solution of dish detergent and water was prepared. The amount of dish detergent present in the different solutions prepared above was determined using three different methods that involved measuring the adhesive and cohesive properties of the solutions. After analyzing data I collected I found that as the concentration of dish detergent in water increased the adhesive and cohesive properties of the solutions decreased.

Project Number: SES044

Grade: 11

Title: How Distance Affects Luminosity

Abstract: At night, many people gaze at the stars. This work intended to learn if different shaped stars (and also other celestial objects) produce different luminosities, since not all extraterrestrial beings are perfectly spherical. Three different shaped incandescent light bulbs' light intensities were separately tested by using a light meter attached to a music stand at various distances. It was determined that objects with more centralized sources of light had greater light intensities than those that did not. There was a significant difference between this data. Future work and research is planned to determine if this applies to all celestial objects.

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Project Number: SES045

Grade: 12

Title: What the Frack?

Abstract: The rise in the drilling of Marcellus Shale is causing safety concerns about the fracking water used in hydraulic fracturing to create the natural gas wells. This experiment will replicate the fracking water used in these gas wells to find a sub lethal concentration (Colborn 2010). Dilute the fracking water into 100%, 75%, 50%, and 25% using spring water. Establish a sub lethal concentration on daphnia. Use that sub lethal concentration in the microcosms that were already made to see if the environmental factors of the microcosms affect the sub lethal level of the replica fracking water.

Project Number: SES046

Grade: 11

Title: Does the location of windmill farms affect the individual public's opinion?

Abstract: As the world makes countless discoveries and technological advances some inconvenient truths are always found. One of them is the harmful effects of the use and depletion of fossil fuels. This being discovered encourages the discovery of ways to harness renewable energy sources such as wind. As these changes in society occur extreme opinions form of those who support and oppose these drastic advances, but what determines these opinions? Could the location of a new energy system such as a windmill farm be a factor in determining whether or not one agrees with these advances?

Project Number: SES047

Grade: 11

Title: Gray Water Testing

Abstract: The purpose of this experiment is to test gray water to see if there are bacteria or chemicals that could be potentially harmful to humans or animals. First, 2 plastic containers will be filled with gray water from one source in Thorn Creek. Then 2 more containers will be filled at a source above the gray water site and 2 below the gray water site. The water will be tested for the presence of phosphorus. A total bacterial assay will then be performed. The gray water, diluted to 10^{-4} - 10^{-6} will be plated and left to incubate for 24 hours. Then the colonies of bacteria will be counted and recorded. In the end the results will be compared to the drinking water standards reported by the EPA.

Project Number: SES048

Grade: 11

Title: Bio Fuel from Algae

Abstract: This research project is to explore if algae lipids are viable fuel based on the replication of my research on algae oil in the previous years. In the experiment, the lipids from the algae were extracted via hexane. ^1H and ^{13}C Nuclear Magnetic Resonance (NMR) techniques were used to analyze the algae oil. By interpretation of the NMR data, I will determine if algae lipids are viable fuel. The expectation is the lipids will be a viable fuel since all lipids have hydro carbons.

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Project Number: SER001

Grade: 10

Title: Swift Solar Speeders

Abstract: The purpose of this experiment is to determine the type of solar vehicle design that is most efficient. Four solar vehicle designs with four wheels and three wheels were tested. Each vehicle design is tested on a 5 meter run, measuring the time. Speed is calculated using $s=d/t$. The front wheel drive vehicle with four wheels was the fastest. Fewer wheels do not make a vehicle faster. The front wheel drive vehicle either three wheel or four wheel however was faster than the rear wheel drive designs. This finding will be useful in future alternative fuel vehicle design.

Project Number: SER002

Grade: 11

Title: Creating a Seismograph

Abstract: The purpose of my experiment is to measure the intensity of an earthquake by using a seismograph. The materials used for my experiment are a card board box, a marker, ruler, string, tape, paper, and a motor.

Project Number: SER003

Grade: 12

Title: The Effect of Design and Dampers on Skyscrapers

Abstract: Skyscrapers are a challenge for architects and structural engineers because of their enormous height and movement with the wind. Earthquakes and strong winds contribute greatly to the collapse of skyscrapers and must be dealt with using dampers. In this experiment, many types of dampers were tested, but the hanging counter weight proved to keep the building from moving the farthest. Another major factor when designing a skyscraper is the structure itself. Out of a variety of different structures tested, the basic rectangular prism design held up the longest. This experiment determined the most effective design for a skyscraper in a windy area.

Project Number: SER004

Grade: 10

Title: Effect of Arrow Material on Speed

Abstract: The purpose of this project was to determine whether the material an arrow is composed of affects the speed at which the arrow will travel. A chronograph was used to measure the speed of a variety of arrows at five yards.

Project Number: SER005

Grade: 10

Title: Save the World, One Pallet at a Time

Abstract: In today's economy and environmental state an alternative that is both affordable and good for the environment is not only a priority but a responsibility. This project displays a prototype (a truck) that will eliminate pallets, wooden and plastic carrying devices, by lifting, carrying, and dropping off the objects that need to be carried. This capability will not only remove the need for pallets but will also remove the need for pallet trucks which can cost up to \$20,000. Every year about \$112,350,000,000 worth of pallets are sold. This truck prototype could cut this number in half effectively saving wood and money.

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Project Number: SER006

Grade: 11

Title: Using Energy Created by Phase Change of Water

Abstract: When water freezes it expands and creates energy. If it is possible to use the energy created, then it could be converted and used efficiently. In today's green society finding new ways to conserve energy is a main goal. In this experiment I will use a piston to start a mechanical reaction, which will create a turn table to move. The set up will create a 'domino effect' with the transfer of the potential energy. The expansion of the water freezing will start the reaction without any outside help.

Project Number: SER007

Grade: 11

Title: A Thirst for Energy

Abstract: I hypothesized that if my turbine works well with gears in generating torque, then the high density of slow moving water of a river can be harnessed—using my turbine- to generate electricity. Two turbine designs were tested: 1) 8 blades were fixed radically and 2) 8 were blades hinged radically. They were tested in a flow tank by fixing them to a gear driven motor. (6:1) the fixed blade generated 36 ± 1 mV. The hinged turbine generated 45 ± 2 mV. The hinged design generated high torque, with reduced resistance as the turbine blade left the water; supporting my hypothesis. Research is still being conducted. Final **Abstract** will be available at my exhibit on Fair Day.

Project Number: SER008

Grade: 12

Title: Development of a Reliable, Low-Cost Light Meter

Abstract: This project deals with the construction of a calibrated low-cost light meter that can accurately and reliably determine illuminance with highly reliable components. The meter was based upon a tangential approximation of the logarithmic response of two cadmium-sulfate photoresistors. The photoresistors' responses were experimentally determined with standardized light levels. They were then used as resistors in operational amplifier circuits designed to output illuminance according to the approximations. The meter performed within the expected accuracy range, error was consistent and the used of inexpensive, reliable components was feasible, thus fulfilling the project's goals. This equipment could be used in quantitative measurement.

Project Number: SER009

Grade: 9

Title: Light up the room with LEDs.

Abstract: For this year's science fair, I built a seven colored 63 LED flashlight. The goal of this project was to make the flashlight as small and light as possible, but with using as many LED light bulbs as possible. Each light color is operated by a different switch, and each color has its own circuit. This was done in case a battery dies; the other color lights will still work. I decided to make the device compatible with all 1.5 volt batteries, to permit flexibility among battery usage. The final device was compact, lightweight, and useable.

Project Number: SER010

Grade: 11

Title: Bumper Cars

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Abstract: This experiment is an engineering goal in science and technology. The purpose Design and build a system to avoid impact in what would have been a low speed vehicle collision using electromagnets. In the experiment, two cars were fitted with an electromagnet on the front and rear which are activated by a motion sensor when the cars are about to collide. Severity was measured in decibels from the collisions. There was no collision reached 30 mph. the collision from 30 to 40 mph. did not cause substantial damage.

Project Number: SER011

Grade: 10

Title: Do Type & Construction of Wood in Pykrete affect its strength?

Abstract: The purpose of my experiment was to determine if the type and concentration of wood used in pykrete affects its strength. In experiment 1 different types of wood were used in a pykrete mixture of 14% wood to 86% distilled water. The strength of the pykrete bars was determined and recorded. In experiment 2 a 5%, 10%, 15% 20% and 25% wood to distilled water pykrete mixture was prepared and the pykrete bars were tested. The data collected allowed me to conclude that Red Oak and a 15% concentration of wood to 85% distilled water produced the strongest pykrete.

Project Number: SER012

Grade: 10

Title: Does Temperature Affect the Strength of a Magnet's Magnetic Field?

Abstract: The purpose of my experiment was to determine if different bridge designs withstand earthquake damage better than others. In order perform my experiment I constructed 15 suspension, 15 truss and 15 arched truss bridges from materials that would allow the bridge to experience stresses associated with an earthquake. One of the suspension bridges was securely attached to an earthquake simulator. Then an earthquake was generated and the points of failure in the design and structure of the bridge was determined and recorded. The same process was repeated for the 14 remaining suspension bridges and the other bridge designs being tested.

Project Number: SER013

Grade: 10

Title: Rockets on a Sugar High

Abstract: Potassium Nitrate and Sugar can be combined to form a rather powerful solid rocket propellant. My project intended to build and fly a rocket and rocket motor combination capable of carrying a payload (a video camera) to 1500ft or more. A rocket motor of suitable size and capability has been built and is currently being tested. The first of these motors catastrophically failed while the last one (test fired 2-Feb -2011), performed within 3% of original estimations. Two more motors remain to be tested before construction of the rocket. I will have a final abstract available on contest day.

Project Number: SER014

Grade: 10

Title: Optical Alarm System

Abstract: The entire system will consist of a photo-transistor, a microprocessor, an LED, LED display module, and a complicated circuitry. The photo-transistor will detect the presence of a light change, relative to the sensitivity it is set to. This signal will be sent to the microprocessor

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and causing the system to make a continuing beep and flashing lights. This beep can only be turned off with a password entered into the LED display module. The purpose of this experiment is to detect if an intruder has broken in to your house, and it is an inexpensive and effective way to stop crime rates in America.

Project Number: SER015

Grade: 11

Title: Electric Steam

Abstract: The purpose of this experiment was to prove that a steam engine could generate enough electricity to illuminate light bulbs. The steam engine was built, then a DC motor was bought to attach to the steam engine with a rubber band to the flywheel, a VOM was set to read if any volts were produced. There was only 2.25 volts produced therefore showing the steam engine was not able to light any of the light bulbs, but was able to produce electricity. If there was more torque from the engine, the light bulbs would have been illuminated

Project Number: SER016

Grade: 10

Title: Green Energy from a Water Turbine

Abstract: The engineering goal of my project was to generate a greater amount of electricity in a rain barrel than year one by implementing the hydroelectric system to my home. The purpose was to create more electricity by enhancing the components of my generator. Construction started by connecting a rain barrel to my home's downspout. After construction, various engineers discussed with me in organizing a testing procedure. Five rainfall testing days were chosen, and multiple results were measured. I also calculated additional variables by developing my own Excel workbook. Power generating rain barrels can impact the world!

Project Number: SER017

Grade: 11

Title: The Three Electromagnetic Motors

Abstract: We use small electric motors everyday of our lives and most of the time don't even realize it. This experiment is to show how electromagnetic motors function. Each motor consists of the same parts. A battery holder, battery for the holder, bare copper wire, magnetic wire, and a magnet. In conclusion the motor with the least magnetic wire spun the fastest. Statistics were correct in being that less wire is less weight.

Project Number: SER018

Grade: 11

Title: I Know It Can Blow

Abstract: My project will demonstrate the application of a wiperless cleaning technique for automobile windshields using a high speed air blower.

Project Number: SER019

Grade: 11

Title: Concrete Corrosion Protection

Abstract: Concrete corrosion in America is a very significant problem. When steel reinforcing bar corrodes it becomes weaker and can breakout the surrounding concrete. There are

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chemicals commercially available that have been proven to prevent the corrosion, but the amount of chemical reaching the reinforcing steel is a limiting factor in preventing corrosion. This project was designed to evaluate the effectiveness of a pressure treatment method against the recommended standards. I found that if the chemicals are injected under pressure they become significantly more effective.

Project Number: SER020

Grade: 9

Title: Novel Windmill Design

Abstract: Alternative energy sources are in critical need in the future. Wind power is an excellent renewable energy source, but conventional windmills can be unattractive and dangerous to birds. The design and test results of a wind energy system that can be installed on a home with virtually no change to the appearance is presented.

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Project Number: SMH001

Grade: 9

Title: Antimicrobial Effect of Garlic Extract

Abstract: The purpose of this experiment was to determine if garlic extract would affect the survivorship of E. coli. E. coli samples were exposed to the following concentrations of garlic in Sterile Dilution Fluid: 0.1%, 1%, and 10%. After a twenty minute incubation period, aquilots were spread on LB agar. E. coli was directly exposed to a 10% concentration of garlic extract on LB agar. The resulting colonies were counted and analyzed with an ANOVA and Dunnett's Tests. Significant reductions of bacterial colonies were found for 1% and 10% concentrations of garlic. Exposure to garlic extract adversely affected E. coli survivorship.

Project Number: SMH002

Grade: 9

Title: Vitamin E Effects on Bacteria

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

Project Number: SMH003

Grade: 10

Title: Glucose effects on stressed yeast

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

Project Number: SMH004

Grade: 11

Title: Acillin: A Study of Natural Antibiotics

Abstract: Experiment still being conducted. Abstract will be available at fair.

Project Number: SMH005

Grade: 9

Title: Can H₂O Boil in Microwave Hinder Proliferation of E. coli?

Abstract: The purpose of my experiment was to determine if water boiled in a microwave will inhibit the proliferation of E.coli better than water boiled on a stove. Sterile Luria broth solutions inoculated with E.coli were prepared using water that had been boiled for different lengths of time in the microwave or on the stove. After incubating for 48 hours a colony count and the optical density of the bacteria present was determined and recorded. The data collected supported my hypothesis proving that water boiled in a microwave inhibits the proliferation of E.coli better than water boiled on a stove.

Project Number: SMH006

Grade: 11

Title: Neutralizing Ability between Natural and Chemical Antacids

Abstract: This experiment compared the effects of synthetic antacids versus natural remedies. Synthetic antacids included Tums, Pepto Bismol, and Gaviscon. Natural antacids included lemon juice, ginger, and cinnamon. The acidity of each antacid was found. A sample of each was added to 25mL of hydrochloric acid. To calculate effectiveness, the difference in

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the pH of the HCl was calculated. After three repetitions, the data resulted in the synthetic antacids affecting the acidity of the HCl the most. In conclusion, the synthetic tablets were more effective but were too potent, raising the pH level higher than the range of a healthy stomach.

Project Number: SMH007

Grade: 12

Title: Antioxidants and Free Radicals

Abstract: The purpose of this experiment is to determine which supplement destroys the most free radicals. While researching, I could not find any sources determining one supplement better than the other, so I want to determine which is best. I created a solution containing free radicals and tested it in a spectrophotometer. I then added an antioxidant supplement and placed it in the spectrophotometer. I was then able to draw a comparison between the three antioxidant supplements and conclude which of the three destroyed the most free radicals.

Project Number: SMH008

Grade: 11

Title: Determining cell autonomy in TPI Sugarkill Mutation in Drosophila

Abstract: This experiment investigates with a series of progressive, neurodegenerative diseases caused by TPI deficiency present in humans and modeled in *D. Melanogaster*. Previous data using a GAL4-UAS system demonstrating tissue-specific phenotypic rescue has suggested non-cell autonomy. This experiment sought to determine if such data resulted from transcription of the healthy protein by other factors (gene leak) or reflected non-cell autonomy. The results suggest the former of the two explanations, as Locomotor and Temperature Sensitivity testing demonstrated phenotypic rescue in flies bearing the healthy UAS gene but lacking the GAL4 driver.

Project Number: SMH009

Grade: 9

Title: Passive Cooling

Abstract: The purpose of my experiment is to see if passive cooling is as effective as refrigeration that uses electricity. To test this experiment, I will fill two drinking glasses with 200mL each, place one in each fridge for 300 seconds, and see which sample cools down faster by checking the temperature afterward. My hypothesis is if the temperatures of the fridges are the same, the evaporative cooler fridge will cool down the water faster than the electric refrigerator. Resources that helped me form this hypothesis are provident-living-today.com, fsis.usda.gov, consumerenergycenter.org, oikos.com, and energybulletin.net.

Project Number: SMH010

Grade: 10

Title: Beyond the Five Second Rule

Abstract: Culture food of various consistencies after it has been left on the floor for varying amounts of time to determine bacterial contamination levels.

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Project Number: SMH011

Grade: 12

Title: The Effect of UV Light on Bacteria

Abstract: I will use a UV light to test The effects of UV light on certian types of bacteria. The purpose is to understand the composition of the bacteria.

Project Number: SMH012

Grade: 11

Title: Effect of BAT3 on Autophagy in HCT116 Cancer Cell Line

Abstract: Much about the role of autophagy in cancer is unknown; however, it has been shown to allow for prolonged survivorship in tumor cells with defects in apoptosis. I aim to evaluate BAT3's effect on autophagy within HCT116 colorectal cancer cell line. I hypothesize that suppression of BAT3 promotes autophagy, as it has been shown to limit apoptosis. BAT3 knockdown and wild type cells will be exposed to autophagic stressors, and the effect will be quantified by evaluating LC3 punctae formation. As the project has yet to be completed in its entirety, conclusions have still to be drawn.

Project Number: SMH013

Grade: 10

Title: To/Not to Wash: How to Clean Your Hands as All?

Abstract: This experiment investigated the effectiveness of different hand-washing methods by comparing hand sanitizer, baby wipes, and soap. Volunteers rigorously rubbed their hands together for 20 seconds after a detergent was applied. Hands were swabbed with sterile cotton swabs that were then rubbed onto agar gelatin plates placed into an incubator set at 37°C immediately thereafter. Data was collected on day 3 after samples were taken by counting the number of bacterial colonies. Hand sanitizer displayed the most decrease by an average of 70% compared to no hand-washing. Baby wipes, in contrast, performed the worst with an increased growth of 404%.

Project Number: SMH014

Grade: 10

Title: The Sports Fuel Dilemma

Abstract: The purpose of this experiment is to determine whether swimmers suffer any performance changes if they consume a food or beverage sample immediately before completing an event. Swimmers consumed a common food or beverage sample and were then timed while swimming a 50 yard freestyle event. Data includes the times swimmers had in the events and individual feedback reports regarding pain levels.

Project Number: SMH015

Grade: 9

Title: Anitmicrobial effects of Tobacco

Abstract: The purpose of this experiment was to examine the effects of smokeless tobacco on human microbial flora. Smokless tobacco was added in varying amounts to E. coli in sterile dilution fluid, followed by plating onto LB agar. The results showed that smokeless tobacco had a significant negative effect at 0.1%and 1% concentrations. In conclusion, the null hypothesis was rejected and the alternative hypothesis was accepted.

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Project Number: SMH016

Grade: 11

Title: Protein affect on muscle stem cells

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

Project Number: SMH017

Grade: 11

Title: Folliculitis: Cure and Prevention

Abstract: Pig skin was used to replace human skin, and after it was coated with staphylococcus epidermis and shaved, razors were either rubbed with alcohol or not rubbed with alcohol. Razors were either kept in shower situation or kept in dry environment. Before and after shaving, the razors were stamped on Petri dish, and were also stamped after being kept overnight. All colony forming units of bacteria were counted. It was found that keeping the razors in a dry environment prohibited bacteria growth, and rubbing alcohol decreased the amount of bacterial contamination, but did not completely get rid of all bacteria.

Project Number: SMH018

Grade: 9

Title: Antimicrobial Effect of Sunscreen

Abstract: The purpose of this experiment was to determine if sunscreen affects the survivorship of E. coli. 0.2 mL aliquots of 0.1%, 1%, and 10% concentrations of sunscreen was spread on LB agar plates and E. coli (approximately 300 cells) was spread onto the plates. The resulting colonies were counted and the 0.1%, 1%, and 10% concentrations did not have significant antimicrobial effects. The null hypothesis that the sunscreen would not affect E. coli survivorship was accepted in this experiment.

Project Number: SMH019

Grade: 10

Title: UV Influence on Viral Infection

Abstract: The purpose was to assess the effects of UV light on viral infectivity. The procedure was: E. coli B was grown, virus was diluted, phage was added to microtubes and exposed to UV light, virus, E. coli, and top agar were mixed and poured onto the plates, plates were incubated. The data was: an average of 87 plaques for 0s, 66 for 20s, 52 for 40s, 22 for 80s, and 12 plaques for 120s. The variable affected viral infectivity. Statistical analysis showed that the individual results compared to the control are significant. The virus was altered resulting in less infection.

Project Number: SMH020

Grade: 12

Title: Bouncing Bacteria

Abstract: How do certain substances, like nicotine, ginseng, melatonin, and caffeine, affect the growth of cells to imitate cancer? Clean and sanitize the test tubes I plan to use by placing them in the autoclav. Measure out the correct amount of Luria broth for the E.Coli. Do the same using Tryptic Soy broth for the Staph Epidermidis. Keep a set of each aside for a control. Add specific amounts of each solution to the bacteria. Ex: One has a certain amount of nicotine, another with a certain amount of ginseng, etc. Take the initial transmittance using the Spec 20 and record in a data table. Look at the samples under a light microscope and

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record observations. Place in incubator at 27° C. Culture and check in 24 hour intervals. Upon each check, take the transmittance again with the Spec 20 and record in data table. Examine with a light microscope every 24 hours. Record observations. Continue steps 8, 9, & 10 until 96 hours is reached. Dispose of bacteria by autoclaving them. Currently, no data. Due to my school cutting the time allotted to work on my project, my project is still not completed. Research is still being conducted. Final abstract will be available at my exhibit on Fair Day.

Project Number: SMH021

Grade: 11

Title: The Effect of fish oil on Human Microbial Flosa

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

Project Number: SMH022

Grade: 12

Title: Is Your Shampoo Giving You Acne?

Abstract: Researchers have advised against using Sodium dodecyl sulfate and Phloxine B. It is reported that these compounds enhance the growth of acne causing bacteria. This experiment will examine the effects these compounds have on bacteria. Treating 4 samples of Staphylococcus epidermidis (from a 24 hr broth culture) with SDS, 4 samples with Phloxine B, 4 Samples with SDS and Phloxine B, and 4 control will allow the Enumeration of bacteria through serial dilution and plate cultures. The number of Cfu's in each group will be compared to determine if SDS, Phloxine B, or a combination of both increases bacterial growth.

Project Number: SMH023

Grade: 12

Title: Vitamin E Attenuation on Heat and UV Stressed Cell

Abstract: The purpose of this experiment was to determine if vitamin E had a significant effect on the growth and survivorship of heat and UV stressed yeast cells. The yeast cells were grown, three concentrations of vitamin E were prepared, 0%, 0.1%, and 1.0%, they were applied to the cells, the cells were exposed to heat or UV, and the colonies were counted. Statistical analyses were performed on the data and indicated that the vitamin E had a significant effect on the growth and survivorship of UV and heat stressed cells.

Project Number: SMH024

Grade: 9

Title: Anti-Microbial Effects of Household Cleaners

Abstract: The purpose of the experiment was to determine the effects of household cleaners on the survivorship of E. coli. Solutions of Lysol and Green Works were mixed with sterile dilution fluid and E. coli cells at 103 cells/ml, followed by plating onto LB agar. For Lysol and Green Works, there were significant reductions in the survivorship of E. coli at the following concentrations as shown by ANOVA and Dunnett's tests: 0.1%, 1%, and 10%. Increasing concentrations correlated with decreasing colonies. At each concentration, Lysol significantly eliminated more E. coli than the Green Works.

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Project Number: SMH025

Grade: 12

Title: The Irreparable Effects of UV Radiation

Abstract: The goal of this project is to test the ability of *saccharomyces cerevisiae* to regenerate after having been exposed to various intensities of UV radiation. Used comparatively to human skin cells in research, the *saccharomyces cerevisiae* and the debilitating damage it undergoes will give testament to whether or not UV radiation damage is irreparable and irreversible.

Project Number: SMH026

Grade: 10

Title: Honey Antimicrobial Effects

Abstract: Honey has been used over time to prevent infections in the wounds of live vertebrates. This experiment intended to determine if honey has antimicrobial properties and if so on which type of bacteria, Gram (-) or Gram (+). Pulse liquid exposure, prolonged exposure, and zone of inhibition experiments were performed and the data was recorded. It was determined that honey does have antimicrobial properties and it works better on Gram (+) bacteria. A Dunnett's test showed all significant results except for .01% for the prolonged exposure. Future work is planned to complete a bacteria static analysis.

Project Number: SMH027

Grade: 10

Title: Effects of Vitamins on Bacteria

Abstract: This project was to test to see the effect of adding vitamins to bacteria cultures. The bacterium was *Citrobacter freundii*, *Clostridium sporogones*, *Lactococcus casei*, and *Escherichia coli*. It was grown inside Petri dishes and left to culture for 48 hours. The cultures were then compared to the control culture which was the bacteria without vitamins, but left to culture the same amount of time. This was to discover if vitamins had any effect on how bacteria cultures grew and how it helped or hurt this process.

Project Number: SMH028

Grade: 12

Title: Growing Iron Bacteria

Abstract: I noticed, as many others with well water have, that my toilet tank has a slime growing on the inside walls. Through research I found the slime is iron bacteria. I want to find out if there is a material that will inhibit that growth. I plan to obtain water from my well and place it into opaque containers, simulating the inside of a toilet tank. I will attempt to culture the iron bacteria onto Plexiglas, microban liners, glass, and porcelain. I will enumerate the bacteria and compare the measurements to see which material best inhibits the bacterial growth.

Project Number: SMH029

Grade: 11

Title: The effect of vitamin C on cell growth

Abstract: Vitamin C (ascorbic acid) is an essential nutrient in humans, and is known to play a vital role in healthy cell development. Emerging research suggests that extremely high doses

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of vitamin C may suppress cancerous tumor growth; however, vitamin C may have harmful side effects if taken at high dosages as a daily supplement. This experiment seeks to study the effects of various concentrations of ascorbic acid on cell growth, and to determine the mechanisms through which vitamin C brings about these changes, if any.

Project Number: SMH030

Grade: 12

Title: Lip Incompetence

Abstract: Lip incompetence refers to a rest posture of the lips in which the lips are parted. Although possibly detrimental, some orthodontists and myologists view it as a normal developmental stage for children. This project's purpose was to see whether the presence of lip incompetence decreases as children grow up (from age four to fourteen). Classrooms of students were observed and both age and presence of lip incompetence were recorded. The percentages of children with lip incompetence from each age group were plotted and an ANOVA test was run. The presence of lip did in fact statistically decrease as children aged.

Project Number: SMH031

Grade: 10

Title: How Hydration/Dehydration Effects Our Quiz Scores

Abstract: I want to see if we score lower on quizzes when we are dehydrated. Participants will take a six question quiz before starting the experiment. Then they will dehydrate themselves for three days by drinking no more than 56 fluid ounces per day. On the third day they will take another six question quiz. I will give them a week off and then they will hydrate themselves for three days by drinking half their body weight in fluid ounces. On the third day of hydrating themselves, the participants will take yet another six question quiz. This experiment is still being conducted

Project Number: SMH032

Grade: 12

Title: To Wii or not to Wii?

Abstract: The purpose of this experiment is to determine if the Wii Fit Balance Board improves balance in high school students in four weeks. The hypothesis of this experiment is the following: If high school students use the Wii Fit for four weeks than their balance will improve. High school students who have never used the Wii will be the subjects. The experiment is still in progress so results are pending.

Project Number: SMH033

Grade: 11

Title: Bad Bacteria

Abstract: The problem of my experiment was that I was wondering how much bacteria was actually on common household items. I then wondered what would be the outcome if I cleaned the objects and then took another sample one day later. I was very curious about what types of bacteria would be on the surfaces of these items. Many different diseases could be carried on these objects, and I wanted to maybe learn what types. The procedure I went by was simple. In the morning I took swab samples and transported them to school. Immediately I swabbed the samples onto agar plates. I followed the same procedure the second test, except before swabbing, I cleaned the objects with bleach. The third test was the same as the first. My data showed that there was in fact a lot of bacteria on the surfaces of the items before cleaning. It then showed that almost all bacteria was immediately following cleaning. The third

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test portrayed that large amounts of bacteria were there once again. In conclusion, I came up with results that I hypothesized.

Project Number: SMH034

Grade: 10

Title: Comparing pH of Beverages to Human Teeth Corrosion

Abstract: My experiment is analyzing the effect of different beverages to the corrosion of human teeth. The purpose of this project is to visually see and analyze the effect of what we drink and understanding any complications that arise. There are 18 teeth, with 6 groups in total. There are 3 teeth per group, each being placed in one of the five solutions, or in the control group. Each tooth was immersed in a container filled with 20 milliliters of solutions for 14 days (replaced daily). The conclusions of the experiment were that the teeth soaked in solutions with a lower pH had more corrosive complications than solutions with a higher pH.

Project Number: SMH035

Grade: 11

Title: The Effects of DHA on Cell Cycle Regulation in Human Cancers

Abstract: The purpose of this experiment is to determine how Docosahexaenoic Acid (DHA), an ω -3 polyunsaturated fatty acid, affects cyclin levels within cancer cells to arrest the cell cycle, thus inhibiting cell proliferation. Cancer cell lines were treated with DHA. The cells were harvested at varying time-points and the protein was collected via gel electrophoresis and transferred onto a membrane. A Western Blot was performed and stained with antibodies to detect specific cyclin proteins, DHA treatments did in fact reduced the levels of Cyclin A in Melanoma line 526 explaining its arrest in S phase.

Project Number: SMH036

Grade: 11

Title: Copper Antimicrobial Effects

Abstract: The purpose of this experiment was to assess the effects of Colloidal Copper exposure on the survivorship of E. Coli and Staph Epidermidis through implementation of prolonged exposure through agar infusion and pulse liquid exposure. The first procedure was pulse liquid exposure. Staph Epidermidis and E.coli were added to different concentrations of colloidal copper, plated, and then the colonies were counted. The second procedure was prolonged exposure through colloidal copper agar infusion in plates. A concentration of colloidal copper was infused in plates. Staph Epidermidis and E.coli were added to the infused plates and the control plates without infusion. For both procedures the data shows that with an increase of colloidal copper concentration there is a decrease in colony counts. The null was rejected at all values in both colloidal copper pulse liquid exposure and in prolonged colloidal copper exposure (agar infusion) since ANOVA and Dunnettes Test stat analyses show the variable significantly reduced the survivorship of E. coli and Staphylococcus Epidermis. Research applications include use of copper in prosthetic body parts and as a substitute metal in frequently used objects, i.e. doorknobs, bathrooms, etc.

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Project Number: SMH037

Grade: 11

Title: The Real Out Date of Milk

Abstract: Have you ever had milk after the expiration date and it tasted fine? The work conducted in my experiment was to find the real out date of milk. Milk's real out date is when it reaches 1,000,000 bacteria per milliliter. I placed one milliliter of milk in a Petri dish with Counting Agar. They dishes were set in an incubator for 2 days. The milk was tested 6 days before expiration, day before expiration, the day of expiration and days after. It was found that milk's real expiration date is three days after the milk is said to expire.

Project Number: SMH038

Grade: 12

Title: Immunity Assay of Lysogens

Abstract: A mycobacteriophage is a virus that infects mycobacteria, such as Mycobacterium tuberculosis (TB). A lysogen is a bacterium that a bacteriophage has infected but is in a dormant stage. The determination of becoming a lysogen is performed by the bacteriophage's repressor system. Various bacteriophages with similar genetic sequences share the same repressor system. Hypothetically, all bacteriophages that share a repressor system that infect a lysogen that was created by a bacteriophage that also shared the same repressor system would be repressed upon infection. Repressor systems are still often unknown in many bacteriophage genomes. Through conducting an immunity assay, I determined the homoimmune relationships between lysogens. I also classified bacteriophages based on their repressor system.

Project Number: SMH039

Grade: 12

Title: Super Soap

Abstract: Lately everyone has been worried about germs and getting sick. With the array of antibacterials out there how could one possibly know which one is better? My project will hopefully enlighten the population on which types of soaps will effectively kill bacteria. Various soaps were tested to see which had a bigger "no growth" zone. It was determined that store bought soaps with or without alcohol and my homemade soap are as equally more effective than both store bought Clorox bleach and tap water.

Project Number: SMH040

Grade: 9

Title: Cell Phone Radiation

Abstract: For my experiment I'm testing to see if cell phone radiation from ten cell phones is powerful enough to heat water in test tubes. To do this, I let a bowl of water sit overnight so it is room temperature. Then I measure the temperature of the water. Next, I measure out ten milliliters of water for each of the three test tubes. My data will show whether or not the radiation is powerful enough to heat up the water in test tubes. My conclusion will also state if the radiation is powerful enough to heat the water.

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Project Number: SMH041

Grade: 9

Title: Acne Medication

Abstract: Acne is the top skin problem in the nation, and spending money on products that do not work seems to be another problem. Using nutrient agar, E. coli (strain 12) and 8 different acne medications, this research gathered data to determine the best acne medication to buy and use. Petri dishes were inoculated and different acne medications placed on them. After five days the zones of inhibition was measured. To this point the data shows a slight difference between the acne medications tested.

Project Number: SMH042

Grade: 11

Title: Stressors on Stem Cell Proliferation and Differentiation

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

Project Number: SMH043

Grade: 11

Title: Adrenaline Effects on Stem Cells

Abstract: The purpose of this experiment was to determine the effects of adrenaline on adult stem cells. In the experiment, the scientist exposed two murine cell lines, C2C12 and 3T3 lines, to differing concentrations of adrenaline to determine if the adrenaline had any effect on the number of cells or the number of myotubes that formed from the C2C12 stem cells. The scientist found that adrenaline, in certain concentrations, had an effect on the number of cells and the differentiation of the cells.

Project Number: SMH044

Grade: 9

Title: Do alternative natural antibiotics exist

Abstract: Bacterial resistance is increasing and some bacteria are becoming resistant to antibiotics. This experiment was performed to determine if there are any substances in nature that have antibacterial properties. Paper discs soaked in garlic extract were placed on a Petri dish streaked with E. coli bacteria. These were incubated for 24 hours. This was done with honey and olive leaf extract to determine a zone of inhibition in the eight trials. The honey displayed a large zone of inhibition while the other substances had no zone. Future experimentation is planned on determining whether this same effect occurs with other bacteria.

Project Number: SMH045

Grade: 11

Title: How Calcium Affects Bone Density

Abstract: The purpose of this experiment was to determine how taking in calcium affects bone density. The procedures included soaking bones in vinegar and calcium to see the different bone densities. Each was measured to be able to examine the results. The outcome showed that the vinegar bones became less dense, than the density rose after being soaked in calcium. After one week of the bones being soaked in calcium the bone density increased slightly. The high percentage of calcium was able to positively affect the bone density.

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Project Number: SMH046

Grade: 10

Title: Study of Minimum Inhibitory Concentration of Antibacterials

Abstract: This experiment is designed to evaluate the effect of turmeric, crushed ginger, and powdered amoxicillin on streptococcal bacterial colonies. The hypothesis is that turmeric and crushed ginger will inhibit streptococcal bacteria. To execute this study: the procedure will be as follows: In four separate Petri dishes lined with agar, culture colonies of streptococcal bacteria for one week. Of these, use one as the control, and expose the others to varying concentrations of the above mentioned substances using the inoculation technique. This experiment could prove turmeric and ginger to be effective in the treatment of streptococcal diseases.

Project Number: SMH047

Grade: 11

Title: Stressed? Try Taking a Deep Breath...

Abstract: This experiment was conducted in order to test the effects of yogic breathing on a person's blood pressure, pulse and oxygen saturation, along with the air flow in their lungs. To test the breathing exercises, a total of 12 subjects were used; 6 controls and 6 people doing the assigned breathing exercise twice a day for five minutes each time. At the beginning and end of the month of exercise, the subjects' blood pressure, pulse and oxygen saturation and lung capacity were recorded. The results clearly showed the 6 subjects who had done the breathing exercises having improved blood pressure, pulse, oxygen saturation and lung capacity, making me conclude that yogic breathing definitely has a positive effect on the subjects' blood pressure, pulse, oxygen saturation and lung capacity. This information can be very useful in health, especially for people with heart or lung disease because it shows a simple way of improving their circulatory and respiratory systems.

Project Number: SMH048

Grade: 11

Title: Sanitary Effect of Tea

Abstract: The purpose of this experiment is to find if tea has an antibacterial effect. Four teas will be tested-black, oolong, green, and white (all from the Camellia Sinensis plant)-and placed directly on a bacteria culture with a sterile disk. The larger the diameter of the zone of inhibition around the disk, the more effective the tea is at killing bacteria.

Project Number: SMH049

Grade: 9

Title: Conditions to Produce Cellulose from a Bacteria

Abstract: This study was conducted to determine the ideal temperature and carbon source for the production of most cellulose by *Acetobacter xylinum*. First temperature was used as a variable by incubating the *Acetobacter xylinum* with agar media at temperatures 4 degrees C, 22 degrees C, 30 degrees C, and 37 degrees C for 72 hours. The increased mass, which is directly related to cellulose production, after incubation was noted at the temperature 30 degrees C. Next stage carbon sources, namely, no carbon, glucose, maltose, galactose, and fructose, were changed while maintaining 30 degrees C temperature and media were incubated for 72 hours. The increase in mass (cellulose) was noted when the carbon source was glucose. Thus, the ideal conditions to produce the most cellulose by the bacterium are 30 degrees C temperature when the carbon source was Glucose.

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Project Number: SMH050

Grade: 9

Title: Got germs? The effects of handwashing

Abstract: Hand washing is the simplest mean to interrupt the transmission of many infections. The purpose of this project is to determine what is the most effective hand washing method to kill resident germs. I completed this by using sheep blood agar plates. Using the agents of Dawn, Purell, Joy, and a hospital disinfectant, I imprinted the unwashed hand on one plate and the washed hand on the other plate. I found the inhibition rate for the staphylococcus and the micrococcus of each pair of plates. Dawn had the highest inhibition rate, which meant it killed the most germs.

Project Number: SMH051

Grade: 9

Title: Antibacterial Effects of Makeup

Abstract: Incubate normal skin flora bacteria with different types of makeup and measure survival rates to determine if some brands of makeup are antibacterial.

Project Number: SMH052

Grade: 10

Title: Which Acne Medication Provides The Best Treatment?

Abstract: Many teenagers and adults suffer from acne. The experiment was designed to find the medication serving as the best treatment. E. coli was spread on agar plates. Sterile disks dipped in three medications were placed in the plates. Inhibition zones were measured after incubation. To determine whether bacteria was killed, E. coli and medication was mixed and placed in agar plates and incubated. AcneFree Cleanser (2.25% benzoyl peroxide) created largest inhibition zone Clean & Clear Advantage Cleanser (2% salicylic acid) killed all bacteria and created the next best inhibition zone and is the best permanent solution for acne.

Project Number: SMH053

Grade: 10

Title: Inhibiting Bacterial Growth

Abstract: The project was intended to determine whether certain home remedies inhibit bacterial growth. Agar plates were inoculated with common bacterial strains. Honey, vinegar and turmeric were tested on the bacteria in addition to common antibiotics. The vinegar had substantial inhibition and the antibiotics were most effective.

Project Number: SMH054

Grade: 10

Title: Do chemicals produced by maggots inhibit S. epidermidis?

Abstract: The purpose of my experiment was to determine if maggots produce chemicals that inhibit S. epidermidis. In my first experiment, I collected chemicals produced by maggots by rinsing them in 50mL of water for 1hour, and then I prepared and tested a 0%, 20%, 40%, 60% 80% and 100% solution of these chemicals. I determined the zone of inhibition, colonies formed per cm², and optical density. In my second experiment, I pureed the maggots, and repeated the steps listed above. In both experiments the higher concentrations were more effective at inhibiting the S. epidermidis. The data supported my hypothesis.

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Project Number: SMH055

Grade: 9

Title: Flooring Impact on Bone-Year 2

Abstract: The purpose of this experiment is to help determine what type of flooring would be best to buy regarding the pressure on their bones. The rib bones will first be bought at a local food store and be from USDA approved meat. Next, the bones will be cooked to ensure that they are clean and somewhat sterile. Then, the contraption will be built with a part holding the flooring and another securing the rib. The bone will repeatedly hit the flooring and the results will be collected. This experiment is still being conducted; please see student for completed **Abstract**.

Project Number: SMH056

Grade: 10

Title: Oregano Antibacterial Assessment

Abstract: The purpose of this experiment was to determine if oil of oregano will affect the survivorship of *E. coli* and *Staphylococcus Epidermidis* bacteria colonies. The bacteria were exposed to concentrations of oregano in Sterile Dilution Fluid and aliquots from the cell suspension were plated on LB agar. The resulting colonies were counted and a significant effect of the oregano on the bacteria was found in concentrations of .01%, .1% and 1%. Statistical Analyses were performed to see if there was significant variation. The Null Hypothesis was rejected after exposure to the oregano significantly affected the bacteria survivorship.

Project Number: SMH057

Grade: 11

Title: Antibiotics vs. Herbs-Battle of the Zones

Abstract:

Project Number: SMH058

Grade: 9

Title: Nintendo Wii- A Training Tool or Just a Game

Abstract: My project is called Nintendo Wii- A Training Tool or Just a Game. It's in the electronics category. I'm in the 9th grade. The reason I did this experiment is to see if people really do improve sports by playing Wii and because it sounded interesting to do. I used all the procedures that were in my experiment plan. The average of golf balls hit during the whole experiment was 24 in the hole. The average of tennis balls hit during the whole experiment was 57 over the net. And lastly a combined score of 829 points in bowling for everyone. Every improved except the older people in the experiment.

Project Number: SMH059

Grade: 9

Title: Cranberry Juice antimicrobial properties

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

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Project Number: SMH060

Grade: 11

Title: Do placental amnion epithelial cells have good stem cell capacity?

Abstract: Currently stem cells are being used in regenerative medicine to replace diseased and dysfunctional cells within many tissues and organs including liver, heart, brain (for Alzheimer's and Parkinson's diseases) and spinal cord. Stem cells are also being examined as therapy for skin burns and diabetes. A major goal in this area of research is to identify potential new and useful sources for the isolation of stem or progenitor cells. Several recent reports suggest that cells isolated from placenta have stem cell characteristics. Placenta, and in particular amnion epithelial cells may represent a new source of pluripotent stem cells. These cells have the ability to differentiate into many different cell types. The aim of this study is to isolate placental amnion epithelial cells and place them into in vitro culture and to measure their stem cell properties to better understand if they are a good cell source to investigate stem cell biology.

Project Number: SMH061

Grade: 11

Title: Logging Affecting the Ecosystem

Abstract: I will be conducting and observing an experiment about how logging affects the microorganisms in the soil. To do this experiment I will collect soil samples from a recently logged area, a recovered logged area and a never before logged area. I will then use EcoPlates to determine the effect on the microbial diversity of the soil. This will tell me the efficiency of the nutrients cycling by microbes in the system. I am completing this experiment because I wanted to see how the ecosystem is affected by this specific change in environment.

Project Number: SMH062

Grade: 11

Title: Alcohol: Too Much or Too Little

Abstract: People have been using alcohol-based hand sanitizers for years. In each brand of hand sanitizer there are different concentrations of ethyl alcohol. Different alcohol concentrations have different effectiveness against the bacteria it is fighting. This experiment will investigate the question of whether or not the lower concentrations work as well as the higher concentrations. The two bacteria that I will be using are Staphylococcus Epidermidis and Escherichia Coli. The concentrations of alcohol I will be using are 60%, 75%, and 95%. I will also use sterile saline as a control.

Project Number: SMH063

Grade: 12

Title: Alternative Source for Medical Oxygen

Abstract: The Alternative Source for Medical Oxygen science project is an experiment in which the catalyzed decomposition of hydrogen peroxide is tested as an adequate source of medical oxygen. This process will use the procedures of researching current oxygen concentrators and the creation and testing of an oxygen producing prototype. Data will be collected on the rate of oxygen release and total oxygen capacity of the prototype. This data will be analyzed by comparing it to current medical oxygen concentrators; it will be concluded if it is equal or better than what is already available.

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Project Number: SMH064

Grade: 11

Title: Is the Mechanical Action of Hand Washing as Effective Against Bacteria as Hand Sanitizer?

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

Project Number: SMH065

Grade: 11

Title: Supplement Effect on C2C12 Cells

Abstract: Caffeine and creatine are two commonly used substances, one to stay awake and the other to promote muscle growth. They are often taken together as well. The purpose of this experiment was to determine their effects on muscle stem cell growth. They were each added separately and together to a C2C12 mouse cell line to test proliferation and the differentiation of the muscle stem cells. It was found that they each had a statistically significant effect on differentiation and proliferation by themselves, but have no effect on each other. Creatine had a positive effect but caffeine had a negative effect.

Project Number: SMH066

Grade: 12

Title: Staph on Locker Room Benches

Abstract: Bacterial infections are a significant risk in playing organized sports. One way to reduce infection is to make common contact surfaces anti-microbial. Wood and metal are the two most common materials used to make locker room benches, but may provide a better growth platform than a plastic based bench would. The samples were inoculated with a broth culture of *S. epidermidis* and incubated overnight. They were then enumerated and compared to find the material that provides the worst growth platform for microbes

Project Number: SMH067

Grade: 11

Title: Oh Sugar!

Abstract: The hypothesis is that fruit flies that consume glucose and sucrose in addition to fruit fly food will not reproduce as much as fruit flies with only fruit fly food. The same amount of fruit fly food was added to three vials, one containing only fruit fly food, another with fruit fly food and sucrose, and another with fruit fly food and glucose. Initially, ten fruit flies were in each vial. After two weeks, the vial with only fruit fly food contained 48 fruit flies, the vial with sucrose contained 14 flies, and the vial with glucose contained 10 flies.

Project Number: SMH068

Grade: 12

Title: Chemical Modulation of Innate Immune Signaling

Abstract: My purpose is to identify inhibitors or enhancers of innate immune signaling so that they can be used as anti-inflammatory agents. I will do this by treating cultured cells with libraries of various chemicals using multi-well plates. I will measure inhibition of innate immune signaling through luciferase activity by high-throughput screening. Then I will identify inhibitors which have specific antagonistic effects on innate immune signaling.

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Project Number: SMH069

Grade: 9

Title: Oil's Effect on Microbes

Abstract: The purpose of this experiment was to determine if crude oil would affect the survivorship of E. coli. E. coli was exposed to various concentrations of oil in Sterile Dilution Fluid for a twenty minute incubation period and aliquots from the cell suspension were plated onto LB agar. The resulting colonies were counted and no significant effect on cell survivorship was found in the tested oil concentrations of 0.1%, 1%, and 10% compared to the control. The null hypothesis was accepted in this experiment and the twenty minute exposure to oil did not adversely affect E. coli survivorship.

Project Number: SMH070

Grade: 11

Title: Cinnamon vs. Bacteria

Abstract: Cinnamon is very beneficial; it improves blood pressure, digestion, flu and cold systems, and bacterial infections. The purpose of my experiment, Cinnamon vs. Bacteria, was to see if I could decrease mouth bacteria with cinnamon. To conduct this experiment, I first prepared agar Petri dishes and products I would use, and then I swabbed saliva out of my subjects' mouths. After testing a given product, I take another swab out of my participants' mouths and incubate at a temperature of 95° for 5 days. Research is still being conducted. Final abstract will be available at my exhibit on Fair Day.

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Project Number: SPH001

Grade: 11

Title: Frequency Projections in a Classroom

Abstract: Altering sound projection in a classroom can rely on the movement of the sound in the classroom. Changing frequency, or pitch, of a sound may improve sound loudness. This researcher tested different frequencies in a classroom to simulate male and female voices. By recording decibel readings at different marked spots throughout the classroom, the amounts the frequencies increased or decreased in loudness were apparent. This difference may be due to sound absorption, reflection, and overall sound projection. The data thus far showed that frequencies do make a difference in the loudness of a sound.

Project Number: SPH002

Grade: 11

Title: UV Light Affect on Fishing Line

Abstract: The purpose of this experiment is to determine if UV-A and UV-C light affects the strength of monofilament fishing line. Ten strands of each brand of monofilament line were subjected to UV-A light to test durations of 50-hrs, 100-hrs, and 150-hrs. The same tests were repeated for the UV-C light. Once the strands finished their exposure, tensile tests were conducted and results recorded. The recorded results indicate the UV-C light affects the degradation of the fishing line more than the UV-A light.

Project Number: SPH003

Grade: 11

Title: Bouncing The Rock

Abstract: In my project, I wanted to figure out which temperature would keep air in a basketball - a warm temperature or a cold temperature. I believed it would be a cold temperature because the cold air would slow down the movement of the molecules.

Project Number: SPH004

Grade: 10

Title: One-Way Materials That Stop Radio Frequency From Harmful Dispersion

Abstract: In this experiment, different materials will be tested to see if it is possible to create a double-layer material that allows radio frequency to pass through one way, but not the other. This will be tested by first finding coatings and materials and testing them to see if they prevent and prohibit radio frequency from passing through them. After these results are collected, different material and coating combinations will be tested to see if they allow radio frequency to pass through one way, but not allow radio frequency to "leak," as in cell phones.

Project Number: SPH005

Grade: 10

Title: Structural Integrity of Green School Supplies

Abstract: Determine amount of force needed to break recycled materials in comparison to traditional school supplies.

PHYSICS – SENIOR (9TH-12TH GRADE) - SPH

Project Number: SPH006

Grade: 9

Title: Winglets, Newer or Older?

Abstract: Are winglets that people use on airplanes today actually better than ones that people used about two years ago? That's what this researcher tested in this project. They tested three newer designed winglets against three older winglets along with a control and a smaller bonus winglet. After five trials, at different top wind speeds, they concluded that new winglets are actually better in their overall performance but the best performing wing was the bonus wing. This may have been because the wing was a lot smaller in size and the wing also had a smaller surface area.

Project Number: SPH007

Grade: 12

Title: Investigating Reversible Photochromic Coatings for Energy Conserving Windows

Abstract: Photochromic coatings have been used on transition lenses to attenuate sunlight to the eyes, and electrochromic systems have been used on airplanes? Windows to reduce sunlight from going into the cockpit and the cabin. The cost is high for both systems; the shelf life is short for transition lenses due to the use of organic materials on the coating. Tungsten oxide can be changed from light green color to dark blue or dark brown when it is in its reduced states. Titanium dioxide has photo-catalytic effects in splitting water to hydrogen and oxygen due to its semiconductor property. Using the mixture of low cost tungsten oxide and titanium dioxide powders to attenuate visible light will be studied. Conductive electrolytes will be investigated to make discoloration reversible. Thus, the coatings on the windows can block sunlight in the daytime to reduce room temperature, and turn to transparent in the nighttime to allow visibility.

Project Number: SPH008

Grade: 9

Title: The Variation of Acceleration of Falling Object of Different Masses

Abstract: The purpose of this project was to determine the approximate acceleration of gravity close to the earth's surface, and to decide if the acceleration of gravity varies according to the falling object's mass or speed. Steel balls were dropped from an electromagnet at different heights. The time it took for the balls to land was measured. The average results for the calculations of the acceleration of gravity varied from approximately 29.1 to 30.8 feet per second. Sources of error were discussed.

Project Number: SPH009

Grade: 11

Title: Bubble, Bubble, Oil and Trouble: The Evolutionary Behavior of Oil Bubbles in Saline

Abstract: A closed cell model was made to analyze the behavior of oil microbubbles dispersed in saline. After sonicating oil and saline for 10 or 60 seconds, the emulsion was aliquoted into a polydimethylsiloxane well with a cover glass. A light microscope was used to observe the bubbles. By increasing the sonication time, initially the bubbles were smaller, and less were seen on the surface. Over time, they became bigger. Also, the shape of the bubbles was spherical before and after coalescence. This information may be useful in understanding bubble behavior in microfluidics and the Gulf of Mexico oil spill.

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Project Number: SPH010

Grade: 9

Title: The Bright Idea

Abstract: The investigation was conducted to determine whether LED, CFL, Halogen, or Incandescent light bulbs were the most efficient. The heat emitted was translated into how much energy was wasted by each light bulb. Each light bulb was dipped in water and the water's change in temperature determined the watts per hour emitted. The results showed that LED was the most efficient light bulb. However, even though LED was 28% more efficient than CFL, the second most efficient light bulb; it was 720% more expensive than CFL per light bulb. Therefore, CFL is the most practical light bulb.

Project Number: SPH011

Grade: 11

Title: Arch Enemies

Abstract: The purpose of this lab was fulfilled by determining if width had an effect on the strength of an arch. The experiment was conducted using patterns in the shape of an arch to create models to test. After the models were carefully created they were tested in a stress test analyzer to determine how much weight each arch can hold. The data shows that the 10x10cm arch held the most weight of 25.15kg, and the 20x10cm arch held the least amount of only 14.75kg. It was discovered as the hypothesis predicted that width does affect the strength of an arch.

Project Number: SPH012

Grade: 10

Title: Wing Lift Variables

Abstract: In my project, I tested different wing designs to determine which design would produce the greatest amount of lift. I created three different wings; each one was a different shape. I turned on a fan and added washers, which acted like weights, to each of the wings to see which one would lift the most amount of washers. My hypothesis was the asymmetrical wing would produce the most lift. After testing, the flat bottomed design produced the most lift, the symmetrical design produced a little less lift, and the under cambered design provided the least amount of lift.

Project Number: SPH013

Grade: 11

Title: Windmill Efficiency

Abstract: The purpose of this experiment is to determine whether varying the number of blades on a windmill or adjusting the angle of the blade will affect the amount of energy produced by the windmill. After running multiple trials it was determined that using 3 blades is most efficient at low speeds and 2 blades is more efficient at high wind speeds.

Project Number: SPH014

Grade: 10

Title: Durability of Football Helmets Following Repetitive

Abstract: The purpose of this study was to determine the durability of football helmets after repetitive impact (making it unique) and the implications it may have on concussion related injuries. Back, side and top of the helmet were analyzed. Side and back impacts were

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conducted by dropping helmet from 5 foot height 30 times. An 8-pound ball was dropped from height of 5 feet to simulate top impacts. From this study, concussions are more likely to occur from top impact on helmets. Progress is being made in the design of newer helmets to reduce concussion risks. This investigation may provide focus for helmet safety regarding top impact.

Project Number: SPH015

Grade: 11

Title: The Effect of Air Pressure on Basketball Performance

Abstract: I'm trying to see if air pressure can effect basketball players profromance.

Project Number: SPH016

Grade: 11

Title: Blood Spatter

Abstract: The purpose of this science fair experiment is to determine the effect of drop height on the velocity and resulting size of the initial impact of liquid spatter. To test this, water balloons were dropped from different heights and their falling time and spatter size recorded. The result was that the higher the height the balloon fell from, the smaller the resulting spatter was.

Project Number: SPH017

Grade: 9

Title: Solar Panel Output

Abstract: Does the time and light intensity of a light bulb powered by a solar panel change if the watt of the light bulb changes? This researcher used a PV solar panel to power different watt light bulbs and compared the time and light intensity of each light bulb. The data showed that the lower watt light bulbs were lit for a longer period of time with a lower light intensity and a lower drop in lumens. The higher watt bulbs were not powered as long, but they had a higher light intensity and higher drop in lumens.

Project Number: SPH018

Grade: 10

Title: What relationship between knee/ankle position and tendon strain?

Abstract: The purpose of my experiment is to use a mechanical model of the leg to determine what mathematical relationship there is between the angle of the knee and the ankle joints and the strain on the patellar and Achilles tendons. I constructed the model using springs to represent the tendons. A wire was attached to each spring, and as I bent the leg to the desired angle, the spring would stretch. I would then measure the tension in the spring using Hookes's Law. As the angle of the joint decreased, the tension of the spring increased in a linear relationship.

Project Number: SPH019

Grade: 9

Title: Hockey Puck Friction

Abstract: This experiment determined whether freezing or waxing pucks produced more friction. Fifteen of three types of pucks (frozen, waxed, room temperature) were lined up on the red line and shot towards the opposite red line while being timed. After fifteen pucks were

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hit, a new player was used to hit the pucks. All variables were tested this way. Times were averaged and compared. An ANOVA was used to compare the data and showed that the data collected thus far were due to chance. Averaged data showed that all types of puck had similar times.

Project Number: SPH020

Grade: 9

Title: The Affect of Wing Design on Lift

Abstract: I seek to determine the wing design for an aircraft that would create the quickest lift. The one with the quickest lift would generally lift the best, therefore determining the wing with the best lift. This would help Aerospace Engineers determine which wing design would help the aircraft fly the most efficient.

Project Number: SPH021

Grade: 12

Title: What Makes It Flow? The Effect of Conductors on the Strength of Electrical Currents

Abstract: I will connect light bulbs to a power source with the four conductors and some wire. Which will result in the light bulbs having different degrees of brightness. The conductors must be the same length. The wires have to be the same length also.

Project Number: SPH022

Grade: 10

Title: Archimedes Solar Weapon

Abstract: My project will investigate the use of solar heat to produce a focused high temperature light beam using Archimedes burning mirror theory, that can be used as a high energy weapon.

Project Number: SPH023

Grade: 12

Title: How Awesome is Your Microwave Oven?

Abstract: During this experiment I will be testing different types of microwave ovens with different frequencies. The purpose is to find if they have different radiation wavelengths, and whether this causes interference that makes the hot spots in your food. I will be using eggs to find the wavelength and interference changes. The closer the cooked parts of the egg are to the other cooked part, and vice versa, show the less amount of interference.

Project Number: SPH024

Grade: 12

Title: Follow Through: What does it do

Abstract: I enjoy playing golf and my coach always tells me to work on my follow through. I wondered what exactly does follow through do. My research indicated that the club was in contact with the ball for a longer period of time with a larger follow through and therefore a longer shot. The experiment I set up, however, suggested otherwise. I redesigned the experiment to test whether a loss of club head speed, due to incomplete follow through could be responsible. My results suggested that as the degree of follow through decreases, the distance that the ball traveled decreased exponentially.

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Project Number: SPH025

Grade: 9

Title: The Effects of Smog On Solar panels

Abstract: The purpose of the experiment was to determine if smog affects the performance of solar cells. If smog or clouds were to affect solar panels, then research could be done to find a way to compensate. This researcher simulated smoke by burning paint stirrers. To simulate clouds, this researcher used water vapor that condensed around smoke particles. After collecting five trials of data for each variable, the data was averaged. The amount of energy that was produced negatively correlated to the amount of smoke, fog or smog in the environment.

Project Number: SPH026

Grade: 9

Title: Study of a new nano-composite resistive device for stress detection

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

Project Number: SPH027

Grade: 10

Title: Centripetal Force

Abstract: The purpose of my experiment was to verify that there is centripetal force on an object in circular motion. I used an apparatus where I first attached 6 washers. I spun the apparatus and measured the time it took for 20 revolutions. I repeated this 3 times and then added another 2 washers. With each set of washers, I repeated the procedure 3 times until I had used up 16 washers. With each set of washers I calculated the centripetal force, which should have equaled the force the washers exerted. I found the 2 forces to be fairly close. I accept my hypothesis that there is centripetal force on objects in a circular motion.

Project Number: SPH028

Grade: 10

Title: Can You See It? Contacts and Peripheral Vision

Abstract: The **Title** of the project is "Can You See It?". The category of the experiment is physics. The purpose of the experiment is to determine if contacts have any effect on a person's peripheral vision. The peripheral vision of regular contact wearers was tested. Their peripheral vision was first tested without the contacts, then with contacts. Angular gains were determined based on the differences between the degrees with contacts and the degrees without contacts. The highest angular gain was 15 and the lowest was -10. The conclusion was that contacts do actually have an effect on a person's peripheral vision.

Project Number: SPH029

Grade: 12

Title: Bamboo vs Water

Abstract: I am testing the effects that water has on plants. I have been observing this by watering my plants with different types of water (salt, sugar, and purified). I water my plants once a week and write down their progress.