

2010

**Pittsburgh Regional
Science & Engineering Fair**

**Student Projects
Abstracts**

Senior Division

Senior Division

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Senior Behavioral and Social Science

Project Number: SBS001

Grade: 9

Title: The Power of Suggestion

Abstract: This experiment was designed to test the power of suggestion. Subjects will take an online reaction test once without a sugar substitute pill(placebo) and once with a sugar substitute pill(placebo). The placebo should have no effect on the body at all, however subjects will be told that it will decrease their reaction time. Reaction times will be taken before the placebo is consumed and after. The before and after reaction times will be analyzed to determine if the suggestion is enough to effect any change in reaction time.

Project Number: SBS002

Grade: 11

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. Participants were asked to taste chips and colas and determine whether they were store brand or name brand. In conclusion, the original hypothesis was not supported.

Project Number: SBS003

Grade: 9

Title: Speedy Rubik's Cubes

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

Project Number: SBS004

Grade: 9

Title: Facial Feature to the Test

Abstract: Can people accurately tell the difference between a genuine (real) smile, and a fake smile? This project determined the answer to this question. I tested students with an online testing system, this system showed a short video. When the video was over, students then decided if the smile shown was a real or fake smile. Students also answered another question that stated "How could you tell the difference from a fake smile and a real smile." After testing, results were compared to determine if students could tell the difference between a real (genuine) and a fake smile.

Project Number: SBS005

Grade: 11

Title: Will they see the light?

Abstract: I hypothesized that the Euglena will be drawn to all of the light sources, because if they need the light to live, they will find a way to get to it.

Project Number: SBS006

Grade: 10

Title: The Effect of Stress on Handwriting Pressure

Abstract: The purpose of this experiment was to verify the validity of graphology, pertaining to the effects of stress on handwriting pressure. To test this, subjects were placed under both stressful and stress free environments and asked to "loop-de-loop" on graphed paper at sixty beats per minute to isolate the pressure variable. The difference in masses of the graphite was recorded. The data collected revealed inconsistent results. This is just another proof of the questionable validity of graphology.

Project Number: SBS007

Grade: 12

Title: First Impressions and Facial Expressions

Abstract: Every time someone meets someone new a first impression is made. Are the initial judgments made carried over to the person's overall opinion? And to what extent? These are the questions this experiment will answer. Three different photo flipbooks will be used with the differentiating factor being the first photo in each book to try to simulate a "first impression". A post survey will then compare the subject's response to the flipbooks. I hope to find subjects with a flipbook starting with a happy, disgusted, or neutral expression all have different answers on the post survey composed of one question.

Project Number: SBS008

Grade: 12

Title: Can energy drinks affect your cognitive ability?

Abstract: The purpose of this experiment was to determine whether or not the consumption of energy drinks has an effect on the ability of an individual to perform well on the stroop test.

Project Number: SBS009 **Grade:** 11
Title: What's in your mouth?
Abstract: Please visit student's exhibit for the abstract.

Project Number: SBS010 **Grade:** 12
Title: The Effect of Mental Conditioning on an Athlete's Performance
Abstract: This experiment will determine if imagery, relaxation, goal setting, or no mental conditioning will improve an athlete's performance. I think that the mental imagery will improve the performance because it creates a mental picture for the athlete to unconsciously refer back to. The athletes were mentally conditioned to see which variable will improve their foul shooting. I will collect my data by counting the number of foul shots made before and after the conditioning techniques to see if there was any improvement, and I will also record each person's heart rate.

Project Number: SBS011 **Grade:** 9
Title: Simply Stereotypical
Abstract: Please visit student's exhibit for the abstract.

Project Number: SBS012 **Grade:** 9
Title: Warped Words and The Stroop Effect
Abstract: Please visit student's exhibit for the abstract.

Project Number: SBS013 **Grade:** 12
Title: The Effect of Socio Economic Status on Cognitive Control in 3 and 4 year olds
Abstract: Executive Function is a system of high-level abilities that enables humans to "orchestrate thought and action in accordance with internal goals." Cognitive control is the mental process that allows one to do this. The link between environmental factors and development of cognitive control has not been explored in extensive research. In my project, subjects were asked to complete a Dimension Csrd Sorting Task and a Delay of Gratification task. The successful completion of these tasks is what I will use to measure the level of cognitive control. I will use primary and secondary measures to test the both tasks.

Project Number: SBS014 **Grade:** 10
Title: Environment's Effect on Sleeping Patterns
Abstract: Sleep has been mysterious to people since the beginning of time. This study is to determine whether our subconscious mind is still aware of its surroundings while not in an awake state. Three test subjects will be asked to sleep in their normal environment and in an environment not so normal to them. They will be asked if they felt any significant changes and how rested they felt. The subjects will have controlled diets before bed and kept to their normal schedules.

Project Number: SBS015 **Grade:** 11
Title: Rates at Which Human Eyes Adapt
Abstract: The purpose of the experiment is to find rates at which human vision adapts from light to dark vision in variables such as gender, age, eye color, and presence of diabetes in medical history. The procedure is to test the subjects' vision in both dark and light environments with two different charts, one red font and one blue font. Test vision in light environment first. In the dark environment, test the subjects' vision at intervals of one minute. Collect a completed survey from every subject to categorize the data into the variables. Analyze all data. The hypothesis is not supported.

Project Number: SBS016 **Grade:** 11
Title: Popliteal Light Stimulation
Abstract: Human subjects are tested to ascertain whether high-LUX light sources near the back of the knee (popliteal region) will increase cognitive ability in the classroom setting.

Project Number: SBS017 **Grade:** 11
Title: Turning on the "Light" in Students' Brains
Abstract: It was anticipated that participants would retain more information when exposed to a secondary light source (supplied by special hats with an attached light source).

Project Number: SBS018

Grade: 12

Title: Anything You Can Do I Can Do Better

Abstract: The purpose of this experiment is to determine if gender affects short term memory. Thirty male and thirty female subjects, were shown four pictures. After thirty seconds of examining each picture, it was collected. The subjects were then asked ten questions about the pictures they had examined. The average for females on a female-oriented quiz was 6.3 correct answers; for males, only 4.9. For the male-oriented quizzes, female scores averaged 5.3 and 8.1; for males, 6.2 and 7.8. No gender had a better memory overall. Females did better on female quizzes and males did better on male quizzes.

Project Number: SBS019

Grade: 11

Title: Are you influenced by others?

Abstract: In order to determine the influence of other people in forming opinions, I created a survey that asked people their preference between two items. The control group received a survey with only questions, and the experimental group receive the same survey but was also informed which item was more popular for each question. I did not find a pattern in the results, as knowing the results of the previous survey increased the number of people voting with the majority on only 5 out of 9 questions. After improving my survey and running more trials I hope to find clearer conclusions.

Project Number: SBS020

Grade: 9

Title: The Blind Side do you see what I see

Abstract: Inattentional blindness is a person's inability to perceive something in their direct perceptual field due to focusing on or attending to something else (Skeptic Dictionary). In this experiment certain person's characteristics are assessed. Subjects watch a series of videos showing inattentional blindness and a control. Data was analyzed using Chi Squares. My results gave me mixed reviews, most of the characteristics had little statistical significance. One characteristic close to having statistical significance was age. The older you were, the worse you were. My experiment provided information on whether certain people are or are not affected by inattentional or change blindness.

Project Number: SBS021

Grade: 9

Title: Color My Mood

Abstract: I conducted a survey to ten freshmen students: five male and five female. The survey asked them the emotions that they felt when looking at a color. They also classified each color as masculine/feminine and gave it a comfort ranking. The results allowed to me see how each gender felt, and whether gender impacts the emotional perception of color. I analyzed the responses to the survey and concluded that one's gender does affect how one feels, but it is only one of the many factors. For further investigation, I would ask participants the reasons behind their answers.

Project Number: SBS022

Grade: 10

Title: Eukaryotes Behavior in Space

Abstract: I'm going to attempt to put different types of bacteria into a "space" apparatus. I will attempt to take all the oxygen from the apparatus and then freeze it thus recreating the feel of space. After this i will study how the different bacteria react. I hypothesize that i will successfully be able to recreate space and identify my bacteria. I wasn't able to identify any bacteria with microscope. My paramecium was stolen. I will buy new bacteria and further my research. In conclusion, i couldnt identify anything. So i will have to take better care of my bacteria and make sure they stay alive. I also will look into other errors that may have ocured during my experiment.

Project Number: SBS023

Grade: 9

Title: Effects of LH and FSH on Emotional Perception

Abstract: Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH) are during their menstrual cycle. This project explores how these hormones affect perceived emotion during surges of these hormones. To test this, an emotion test was created using 12 different facial expressions representing 5 different emotions; anger, happiness, sadness, fear, and surprise. The subjects were tested on day 3, 5, and 18 of their menstrual cycle. Results from the emotion tests were then collected, checked, and averaged. The results two hormones found in mammals showed that there is a difference in some females' ability to correctly perceive emotion during hormonal surges.

Project Number: SBS024

Grade: 11

Title: Honey, do these socks match?

Abstract: The experiment was designed to test the myth that the ability for women to note color differences better than men are due to genetic differences between the sexes. The subjects consisted of high school males and

females that each took the same test designed to test color perception. Test takers had to decide if two colors were the same or not. Some colors shown were the same, others were different shades or others were completely different colors.

Project Number: SBS025 **Grade:** 9

Title: Video game players vs. Non Video Gamers

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

Project Number: SBS026 **Grade:** 10

Title: Does suggestion really effect the decision of people?

Abstract: Throughout the course of my project, I will be experimenting whether or not suggestion really does effect the decision of people. To test my question, I will do three different experiments. On one of them, I will have people look at a poster one day and ask me to write down what was on it the next day. I will suggest a certain object that wasn't on the board. The other one will be a group experiment in which I will test the same thing with a video. My third experiment will include a laser pointer to test if my suggestion really does affect the opinions of my test subjects. (They will not know they are being tested on suggestion)

Project Number: SBS027 **Grade:** 11

Title: Creativity vs. Mathematics

Abstract: This project was conducted to compare the creativity of creative professionals to that of mathematic professionals. Do creative professionals have an advantage over mathematic professionals in creativity? Their creativity was determined by their ability to manipulate 3 shapes into a creative design. Each design was judged by 18 students according to their opinions of color, composition, and overall creativity. The scores of all 3 creative professionals were added together, scoring 562 out of 800 points. Mathematic professionals scored 638 points. The hypothesis was supported by mathematic professionals achieving higher scores on their designs, proving that they have creative capabilities.

Project Number: SBS028 **Grade:** 9

Title: Can Children Differ. Between Candy and Meds

Abstract: I hoped to determine if young children can differentiate between candy and over the counter medicines. I tested first graders and kindergarteners to ensure an appropriate age range was tested. In order to conduct the tests I asked each child to differentiate between candy and medicine when it was placed in front of them. I found almost all children can differentiate between candy and medicine. However, the kindergarteners had a more difficult time differentiating between the candy and the medicine. Therefore, pharmaceutical companies should continue researching ways to make the appearance of medicine universally different from that of candy.

Project Number: SBS029 **Grade:** 12

Title: Addiction

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

Project Number: SBS030 **Grade:** 9

Title: The Nose Knows Smell But How About Taste

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

Project Number: SBS031 **Grade:** 9

Title: Delayed Gratification

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

Project Number: SBS032 **Grade:** 9

Title: Multitasking Madness

Abstract: Have one group of people complete a test. The second group will complete the test while multitasking to see if this has an impact on the scores.

Project Number: SBS033 **Grade:** 9

Title: Gamers vs. Non-Gamers: Reaction Time

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

Project Number: SBS034 **Grade:** 9

Title: Personality and Hand Gestures

Abstract: The purpose of this experiment is to investigate the relation between hand gestures, and personality. The main focus of the experiment will be on gestures, physical language, and how people differ. The online "Jung Typology Test™" questions determined people's general personality traits and personal interviews were used to determine the number of hand gestures used as people spoke. By observing the relationship between personality and frequency of hand gestures, this project will help determine if any correlation exists.

Project Number: SBS035 **Grade:** 9

Title: Adding Knowledge to Brains: Boys vs. Girls

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

Project Number: SBS036 **Grade:** 12

Title: New Study Warns: Fear the Media!

Abstract: The purpose of this experiment was to determine how much influence the media has on the opinions held by people. The effect on environmental opinions was emphasized.

Project Number: SBS037 **Grade:** 10

Title: The Effects of Visual Stimuli and Memory Retention

Abstract: This experiment was conducted to determine memory retention of various words when visual stimulus was added. It was hypothesized that any visual stimuli would increase the overall rate of retention. The students were given one of three tests with fifteen random words and pictures. The students had two minutes to study the words and recall them on a timed test. After the data was analyzed with a T-test, the obvious picture retention rate was significantly higher than the definition retention rate. And the hidden picture retention rate was not significantly lower than the definition retention rate. There was no significant difference between the rates of retention with the obvious pictures or the hidden pictures. Conclusively, the hypothesis was accepted.

Project Number: SBS038 **Grade:** 11

Title: Do cell phones inhibit memory?

Abstract: Students were either speaking on the phone or not, and both groups were shown the same ten items in random order. The test subjects were asked to repeat what they remembered seeing. Data showed that students on the phone most often remembered the rainbow picture and the photograph and least remembered the rabbit picture and the scenery picture. While off the phone, the most remembered item was the scenery picture and fewest people could recall the short paragraph they were asked to read. Therefore, students on the phone could recall less than students devoting their entire concentration to the task given. There was a 30% increase in the number of objects remembered.

Project Number: SBS039 **Grade:** 9

Title: Female vs. Male Intelligence

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

Project Number: SBS040 **Grade:** 9

Title: Correlation Between Fear, Age, and Medical Conditions

Abstract: Do fear, age, and medical conditions have any relations between themselves? It is important to know to compare yourself among the crowd. Some people may be able to influence their medical conditions by overcoming fears. To achieve the results, a survey of fear and medical conditions was formed and given to 100 teens and 100 adults. The results were then graphed to see the age group's fears and correlation between medical conditions.

Project Number: SBS041 **Grade:** 12

Title: Don't Upset the Rhythm

Abstract: Many people from amateurs to professionals get nervous while speaking in front of others. The goal of this study is to look at how public speaking impacts individuals' heart rates. The analysis compares individuals' resting heart rates to their heart rates while speaking in front of others with the use of a heart rate monitor and tracking device. Other behaviors that may stem from nervousness were also tracked.

Project Number: SBS042 **Grade:** 9

Title: Mosquito Ringtone

Abstract: With the recent popularity of items such as the Mosquito Alarm (teen repellent) and the Mosquito Ringtone that feature High Frequency Currents (HFC), I wondered if the exposure could have a negative impact on teens' test results or reflexes. Tests were taken by teenage subjects before being exposed to the HFC, after being exposed to the HFC, and while being exposed to the HFC. When comparing my results I found that the HFC did not have a negative effect on the test results, but did serve as an effective distracter based on the reaction to the sound.

Project Number: SBS043

Grade: 10

Title: Does appearance and gender affect presidential voting?

Abstract: This project was done to find whether or not gender and appearance of a person would affect presidential elections and to see what qualities humans would value in a leader. A range of expressions, physical appearances, and genders were presented to subjects on ballots. They were asked to "vote" on the image that included the person they felt would be the best president or leader. It was determined that physical appearance and gender effected how subjects voted immensely. Participants were more likely to vote for a male who was either smiling or had a stoic expression.

Project Number: SBS044

Grade: 11

Title: Are Online Books Worth the Price?

Abstract: The purpose of this experiment is to find out which way of reading is the more efficient for learning. During this experiment I tested 500 students. I split these students into three groups. Group 1 logs onto a computer and reads a passage from an online textbook. Group 2 reads the same passage from a standard (not online) textbook. Group 3 doesn't read at all. After groups 1 and 2 are done reading, I passed out a test for each student to take based on the reading.

Project Number: SBS045

Grade: 10

Title: Nature's Silicon Valley

Abstract: The purpose of this experiment is to see if SiO₂ can be used instead of CO₂ in photosynthesis. I will have two hydroponic systems, one with SiO₂ dissolved in the water and sealed from the outside air, and one normally exposed to the air and with only the nutrient solution in the water. I expect the SiO₂ flowers to die because the larger SiO₂ molecules cannot be absorbed and used as efficiently as small, gaseous CO₂ molecules.

Project Number: SBS046

Grade: 10

Title: Reaction Time with age

Abstract: In this project I am going to test reaction time. I want to know if your reaction time slows down or gets faster as you grow up. Does it stay about the same? Does it depend on the person you are? My hypothesis is that reaction time does get affected according to age difference.

Project Number: SBS047

Grade: 11

Title: Weather and Human Emotions

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

Project Number: SBS048

Grade: 10

Title: Does music affect hand-eye coordination?

Abstract: Music affects other internal and external body rhythms and systems, there it was predicted that music would affect hand-eye coordination. To test this, ten volunteers between the ages of fourteen and eighteen completed simple tasks to three music selections of different tempos as well as to no music. The amount of time needed to complete each task was recorded and averaged. The data was relevant, but it was found that there was not enough information at this time to support the hypothesis.

Project Number: SBS049

Grade: 12

Title: How To Make A Protist Happy

Abstract: The purpose of this experiment was to determine whether or not a simple unicellular organism can use neurochemicals in the same way as a complex being such as a human does. This was tested by giving the protists and algae a melatonin supplement in different dilutions in separate Petri dishes. The resulting behavior was observed and then compared to the control groups. Light microscopes and stereo microscopes were used to observe the behavior of the protists. They were observed everyday over a two week period. During these observations, it was visually obvious that the melatonin had taken a similar affect on the protists as it does on humans. It slowed them down and even induced some into a 'sleep-like' state. With the algae, the melatonin also took an affect, but contrary to the hypothesis, the algae did not go into a 'sleep-like' state of not reproducing, it grew more with the melatonin

supplement. The conclusion of the experiment was that the neurochemicals in complex organisms also have an affect on simple unicellular organisms.

Project Number: SBS050 **Grade:** 9
Title: Which Smile is Genuine or Fake
Abstract: Please visit student's exhibit for the abstract.

Project Number: SBS051 **Grade:** 9
Title: Politics vs. Pop Culture
Abstract: If I test 104 people will there be a majority of better understanding of U.S. government or U.S. commercial culture, and will there be a major difference? To test this I created a political survey of U.S. political figures and a pop culture survey of celebrities. The volunteers were instructed to identify the persons in the survey to the best of their ability. A total of 78 teenagers and 26 adults were tested, in 4 different age groups. The results will be compared.

Project Number: SBS052 **Grade:** 9
Title: Effects Of Video Gaming
Abstract: Addiction is the state of being enslaved to a habit or practice or to something that is psychologically or physically habit-forming. I tested students in my school to see how many people may be video game addicts. I asked 50 students to complete a survey about addiction and then videotaped the student while they were playing a video game. I videotaped their reaction so I could determine if any outward characteristics (body language) were present in those students who were addicted to video gaming. Results from the survey and videotaped were compared for each volunteer.

Senior Biology

Project Number: SBI001 **Grade:** 11
Title: Ultraviolet Light and Bacteria
Abstract: The purpose of this experiment is to determine the effects of ultraviolet radiation have on E. coli as well as the effects different exposure times have. In order to conduct this experiment, three trials were made using E. coli. Plates were either not exposed to radiation, or exposed for 30 seconds or one to three minutes. "T" shape cutouts were used to differentiate between the radiated and non-radiated areas. The most growth was found on the control which was not radiated while the least was found on the three minute trial. The longer the exposure, the less bacteria, in most cases.

Project Number: SBI002 **Grade:** 9
Title: Do magnets have an effect on plant growth?
Abstract: The purpose of this experiment was to determine whether or not magnets have an effect on the growth of plants.

Project Number: SBI003 **Grade:** 9
Title: The Effects of Miracle-Gro on Spider Plants
Abstract: Spider Plants are beautiful when fully grown. In this experiment, the problematic question was, do different amounts of Miracle-Gro affect the growth of Spider plant's roots? The outcome was thought to be that if the concentration of Miracle-Gro was doubled in strength, then the roots of the plant would grow longer than roots with the recommended amount of Miracle-Gro or no Miracle-Gro. The babies of the Spider plants were grown in the different amounts of Miracle-Gro, which was added with water. It was found no Miracle-Gro worked the best with the Spider plant's roots.

Project Number: SBI004 **Grade:** 12
Title: How does UV light affect butterflies?
Abstract: The purpose of this experiment is to see the effect of ultra violet light on butterflies, especially as it pertains to wing span and wing strength. This interests me because as the bee population decreases the need for pollinators rises and butterflies are pollinators.

Project Number: SBI005 **Grade:** 9
Title: Do they hear the music?

Abstract: The purpose of this experiment was to determine whether or not different genres of music had an effect on the growth rate of zinnia plants.

Project Number: SBI006

Grade: 11

Title: Comparison of Hydroponic Systems

Abstract: The purpose of this experiment is to compare two different hydroponic systems, a bubbler system and Nutrient Film Technique (NFT) system. To create this experiment I built both hydroponic systems and put thirty bean stalks in each. The water in the hydroponic systems contained MaxiGro, a nutrient used for hydroponics. The systems were then placed under a grow light for twelve hours per day. After three weeks of growing, the plants were then biomassed. I ran a t-test of two independent means which concluded that there is not a significant difference between the two hydroponic systems.

Project Number: SBI007

Grade: 10

Title: E. coli survivorship in CaCl₂ and Copper (II)

Abstract: Calcium chloride is noted for its effects on the selective permeability of cell membranes to varying substances while copper II chloride functions as an inhibitor to E. coli growth. In my experiment, E. coli solutions of Luria broth were treated with micromolar concentration solutions of CuCl₂, CaCl₂, and both CuCl₂ and CaCl₂. One group was left with no ionic salts added. Optical density at 600nm was determined with a spectrophotometer at time zero and at 24 and 48 hours. A statistically significant increase in survivorship in the presence of CuCl₂ when exposed to CaCl₂ would indicate that CaCl₂ increased membrane permeability.

Project Number: SBI008

Grade: 11

Title: Glow With The Flow: Year Four

Abstract: Ocean acidification is a current and very serious problem. 1/3 of all CO₂ ends up dissolving in the oceans, where it forms carbonic acid before dissociating to bicarbonate and carbonate. The pH of the oceans has already decreased 0.1 pH unit since 1800, and further decrease is expected. The pH change shifts the equilibrium of dissolved carbon away from carbonate and bicarbonate, making them less available to organisms such as plankton, coral and dinoflagellates. To study the increased affect of CO₂ on Pyrocystis fusiformis and Pyrocystis lunula, the experimenter developed an experiment to study how altering the CO₂ levels the dinoflagellates were exposed to would affect their cell structure and pH. After controlling their circadian rhythms, four variable groups that received one CO₂ bubble every 15 seconds, 30 seconds, 45 seconds and 1 minute and a control group that received no increased CO₂ levels were observed 2 hours into their scotophase. While observing these cells under a 400X microscope, the investigator closely analyzed the entire cell structure of each dinoflagellate and rated each cell's chloroplast distribution on a scale of 1- 5, in addition to taking the pH of each variable group. It was concluded that as the amount of CO₂ a variable group received increased, the damage to the cells was much more severe and the dinoflagellate's pH became significantly more acidic. Based on current research and assays being completed, practical applications for this experiment could be applied in the military, medical, commercial and industrial design fields.

Project Number: SBI009

Grade: 11

Title: Bread Mold

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

Project Number: SBI010

Grade: 10

Title: Taster or Non-Taster?

Abstract: Abstract

This experiment shows the relationship in a families' dominant and recessive genes, by having the sample family taste several types of taste papers. For all the different kinds of papers, if an individual is a taster they will have a bitter taste. If they are not they will taste just a normal sheet of paper. If the bitter taste is present that means that the individual is dominant for that taste paper. If they taste a normal sheet of paper that means that the individual is recessive for that specific taste paper. The results showed that half of the family tasted and half did not taste the Thiourea paper. The Sodium Benzoate paper no one in the family tasted the paper. Lastly, 90% of the family tasted the PTC taste paper.

Project Number: SBI011

Grade: 10

Title: Will the fish grow big?

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

Project Number: SBI012 **Grade:** 10
Title: Does the amt of Vit. C in OJ change over time?
Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI013 **Grade:** 11
Title: Minty Fresh
Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI014 **Grade:** 12
Title: The Effect of Temperature on Fingerprints
Abstract: The purpose of this experiment was to find out if temperature affected fingerprints in any way. If so, then making a correct suspect identification would be difficult and could possibly result in a false identification. The procedure: The subjects applied charcoal to a finger and lightly pressed their finger to a glass slide. The slides were then placed in an incubator, other placed in a freezer, and a third set at room temperature to serve as a control.

Project Number: SBI015 **Grade:** 9
Title: A Little Birdie Told Me
Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI016 **Grade:** 12
Title: Transpiration
Abstract: My is experiment about the botanical process of transpiration, or evaporation through the stomata. I set up a buret with rubber tubing attached to a plant and measured the volume lost over 15 minutes. This water lost is the water transpired. Transpiration is also measured under different conditions.

Project Number: SBI017 **Grade:** 11
Title: Pavlov's Fish
Abstract: The purpose of my experiment was to see whether the fish expose to ginko extract have an easier time swimming through a maze.
I think that the fish that were exposed to the herb will have an easier time swimming through the maze.
The procedures used were the best for the fish so nothing could harm them.
For the most part the fish that had been exposed to the herb did have an advantage.

Project Number: SBI018 **Grade:** 9
Title: Clorox Wipes vs. Clorox Spray
Abstract: The experiment was testing to see what kills more bacteria, Clorox wipes vs. Clorox Spray. The bacteria swabbed from the desk was the control. The desks cleaned by the Clorox spray and Clorox wipes were the variables. The bacteria from the swabs were put onto agar plates. The agar plates were placed in an incubator for 48 hours. After 48 hours the number of colonies were counted and averaged for each plate. Overall, it was found that the Clorox wipes killed more bacteria. It is purposed that the wipes contained more cleanser than what was sprayed onto the desks.

Project Number: SBI019 **Grade:** 9
Title: The Effects of Cigarette Smoke on Yeast
Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI020 **Grade:** 12
Title: Spt16 Mutation and DER3 Derepression
Abstract: Determine what parts of the gene encoding Spt16 are essential to its function in the repression of the SER3 gene. Mutate Spt16 and transform it into yeast. Cells showing strong mutations were then DNA sequenced.

Project Number: SBI021 **Grade:** 10
Title: Mating Strategies to Manage Recessive Alleles
Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI022 **Grade:** 11

Title: Use Those Lungs

Abstract: The lungs contain over 300 million air sacs. The process of breathing is done by the diaphragm. This investigation determined the difference in lung capacity of students who play soccer, students who play a woodwind /brass instrument, or non-athletic/musician students. Parent permission and students were educated on how to use a peak flow meter. Each student utilized the peak flow meter three separate times. Data was recorded and analyzed. The students who played the instruments had the highest average lung capacity. The soccer students had the second highest lung capacity. The non-athletic /musicians students had the lowest lung capacity.

Project Number: SBI023

Grade: 9

Title: Coffee Effects on Escherichia coli

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

Project Number: SBI024

Grade: 11

Title: Fruit Fly Traps

Abstract: The purpose of my experiment is to discover which of nine common household substances will trap fruit flies most effectively. I used a plastic container apparatus with two baby food jars attached to holes cut into the bottom. Banana was put into each jar, and the trap substance was put into the variable jar. Fruit flies were released in the middle and counted after 24 hours. After discovering that the fruit flies didn't have a side preference in the apparatus, I discovered that the wine, balsamic vinegar, apple cider vinegar, and yeast and water mixture all worked most successfully.

Project Number: SBI025

Grade: 9

Title: The Nose Knows Smell

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

Project Number: SBI026

Grade: 10

Title: Get a clue: Pointing investigators in the right direction

Abstract: The purpose of this experiment was to determine how much the surface of an object effected the clarity of a fingerprint.

Project Number: SBI028

Grade: 12

Title: The Effect of Fluoride

Abstract: Addition of fluoride to toothpaste and drinking water may not be a positive one considering it is suspected to cause bone cancer. A lethal concentration was tested on daphnia magna and confirmed to be 6.76×10^3 mg NaF/L. The experiment was conducted by growing onion root tips in five beakers of pond water, and five beakers containing pond water with 6.76×10^3 mg NaF/L. The growth of the onion root tips were analyzed and recorded every 24 hours for 120 hours. Physical evidence of the length and number of the roots indicate retardation in the mitotic division of those grown in NaF.

Project Number: SBI029

Grade: 9

Title: DNA: The Onion Way

Abstract: Everyone knows that all DNA is different, but how different is it? This project was done to see the difference between a white and a red onion. Both were prepared the same way, first by chopping them up, then extracting the DNA and finally placing them into an electrophoresis chamber. The hypothesis was that after electrophoresis there would be a subtle difference in the protein bands. Only one long band was able to be seen from the white onion. The red onion did not produce any bands due to problems during electrophoresis. The hypothesis was not able to be proven.

Project Number: SBI030

Grade: 11

Title: Coloring Flowers

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

Project Number: SBI031

Grade: 10

Title: Se Effects on UV Stressed Yeast's Mutagenesis Rate

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

Project Number: SBI032

Grade: 10

Title: Does radiation effect the growth of yeast?

Abstract: This experiment was designed to determine the effect of microwave radiation on the growth of baker's yeast. Yeast samples were grown and put in the microwave for different amounts of time (ranging from two to eight seconds). The control did not go in the microwave. The results of the experiment showed that the longer exposures to microwave radiation and heat caused less growth of the yeast. Some samples' growth were actually enhanced by the effects of microwaves. Growth was measured in height of the foam column and weight of the sample. The weight never varied.

Project Number: SBI033

Grade: 9

Title: The Effect of Hydrogen Peroxide on Plant Growth

Abstract: Roots of plants need oxygen to support the process of photosynthesis. The lack of oxygen to the roots reduces root respiration which shuts down the process of photosynthesis. This experiment is intended to discover if adding hydrogen peroxide to a plant will make it grow better. Plants will be grown with hydrogen peroxide and water. There was a statistically significant difference between the plants grown with hydrogen peroxide and the plants grown with water. Future work is planned to grow plants with different concentrations of hydrogen peroxide to determine if adding more of it will increase its growth even more.

Project Number: SBI034

Grade: 10

Title: Safe Lens

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

Project Number: SBI035

Grade: 9

Title: Cross-resistance of Triclosan Stressed E.coli

Abstract: The purpose of the experiment was to determine if E. coli that have been stressed by the antibacterial agent triclosan show an increased resistance to ampicillin. To perform the experiment, first, nonpathogenic DH5-alpha strains of wild E.coli were exposed to triclosan and plated; the surviving colonies were cloned in LB agar broth. Then, these triclosan resistant (?) colonies were placed in various concentrations of ampicillin solutions that included the working concentration and three dilutions of it. A parallel experiment was done with wild type E. coli which was used as a control and reference. The results do not show significant variance between the resistant and control survivorship, therefore, within the confines of the experiment, the triclosan stressed bacteria did not exhibit cross resistance to ampicillin.

Project Number: SBI036

Grade: 10

Title: Does temper. affect ferment. taste & density of yogurt

Abstract: Yogurt is a product of bacterial lactic acid fermentation in milk. This fermentation acts on milk proteins to give yogurt its texture and characteristic tang. Many companies use different fermentation temperatures to make yogurt. This study is aimed to compare the effects of different fermentation temperatures on the taste and density quality of yogurt product. The best delicious taste and jelly-hard density results were observed on 44 °C fermentation while lower and higher temperatures during fermentation caused inappropriate taste and density changes. Future studies can demonstrate the effects of fruits, jam or sweeteners on the quality of yogurt.

Project Number: SBI037

Grade: 11

Title: The Effects of Common Water Pollutants on Hydra

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

Project Number: SBI038

Grade: 11

Title: The Effect of Lull-A-Fly on Fruit Flies

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

Project Number: SBI039

Grade: 10

Title: RNAi Knockdown of Genes Causes Myofiber Disarray

Abstract: Caenorhabditis Elegans is a common model organism for scientists because its protein structure is similar to that of Homo Sapiens. The gene unc-112 in C. Elegans (the analogue of Mig-2 in H. Sapiens), controls aspects of movement, and the defection of unc-112 causes the worms to roll, rather than slither. In the experiment, RNA Interferences knocks down the unc-112 to cause the "roll gene" defect, but the experiment is centered around seeing whether or not unc-112's knockdown causes myofiber disarray in the worms, which could show a link between the myofiber of C. Elegans and the locomotion.

Project Number: SBI040

Grade: 9

Title: Beverage Effects on Human Tooth Enamel
Abstract: Please visit student's exhibit for the abstract.

Project Number: SBI041 **Grade:** 11

Title: Assay Analysis of Folate in a Prostate Cancer Cell Line

Abstract: Folate is a water soluble B-vitamin essential to methylation processes and nucleotide synthesis throughout the body. However, its optimal levels in the body are debated among scientists. Although folate consumption has been shown to reduce the incidences of colorectal cancer, its effects on prostate carcinogenesis are unclear. By performing *L. casei* microbiological assays and MTT cell proliferation assays, we can determine the amount of intracellular folate in the cell line and compare the differences among cell growth in various medias containing different levels of folic acid.

Project Number: SBI042 **Grade:** 11

Title: Supplementing Crickets

Abstract: The purpose of this experiment was to examine the claims of muscle growth, weight management, and water retention by two products, Creatine and Whey Protein, using crickets as model organisms. The crickets were fed a diet of either powdered milk and calcium supplement on dry cat food, Creatine with powdered milk and calcium supplement on dry cat food, or Whey Protein with powdered milk and calcium supplement on dry cat food. Crickets were assessed by mass and biomass. Results indicate that Creatine increased growth as did the whey protein. The test substances varied on subject water retention.

Project Number: SBI043 **Grade:** 12

Title: Is Organically Grown Food Better?

Abstract: The purpose of my project is to measure the amount of vitamin C in both organic and non organic fruits and vegetables. Overall, I predict that the organic choices will have a higher amount of vitamin C. Specifically; I believe that apples will contain the biggest difference in amount of vitamin C. A titration will be used to measure the amount of vitamin C by using a starch indicator and iodine solution. My data will include the amount of iodine solution that was needed which will allow me to calculate the amount of vitamin C that was in the solution.

Project Number: SBI044 **Grade:** 10

Title: Do all different kinds of bread contain the same mold?

Abstract: Abstract: Usually mold happens to bread or any other food. But, people always want to know if the same mold happens to any kind of bread. In this experiment I will find out if that is true. I will research what kinds of mold are there and take four different kinds of bread and leave them outside. Then, observe the bread and see if the contain the same mold. Based on the test that I do, I will find if the different kinds of bread do contain the same mold.

Senior Chemistry

Project Number: SCH001 **Grade:** 12

Title: Heartburn Extinguishers

Abstract: Heartburn and Indigestion can be a pain when you are trying to have fun. What is the best way to get rid of this uncomfortable feeling? This project was designed to test which types of antacid tablets work most efficiently using titrations to track the amount of HCl acid it neutralizes and pH probes to trace the rate of neutralization. Data was collected for 5 different brands of antacid tablets: Tums, Roloids, Zantac, Gaviscon, and a generic brand- TopCare. After experimentation was concluded, surprisingly, it was determined that the TopCare antacid was the most fast-acting and efficient antacid.

Project Number: SCH002 **Grade:** 9

Title: Which Liquid Dissolves Ibuprofen the Fastest?

Abstract: The purpose of the experiment is to see which liquid dissolves Ibuprofen the fastest. First fill five separate beakers with 150ml of water, milk, Pepsi, Sprite, and apple juice. Then refrigerate until they are all one temperature. Then place one Ibuprofen tablet in the first beaker. Start the stopwatch as soon as the tablet touches the liquid. Once tablet is completely dissolved stop stopwatch and record time. Repeat for all liquids. The results averaged are Pepsi: 102.5min, Sprite: 98min, Apple Juice: 98min, Milk: 97min, and Water: 70.5min. The hypothesis was not supported by the data.

Project Number: SCH003 **Grade:** 9

Title: The Acidity of Orange Juices

Abstract: This experiment evaluated which of three different grown and processed orange juices, had the highest level of acidity. The juice types used included organic, from concentrate and not from concentrate. During the procedure, 120 mL of refrigerated orange juice was measured and data for each of their pH's was collected on pH strips. This test was repeated three times. The data resulted in the juice from concentrate showing the highest acidity of the three types. In conclusion, my experiment showed that an orange juice not from concentrate had a tendency to appear more acidic than other classifications of orange juices.

Project Number: SCH004

Grade: 11

Title: Iron: It's what's for breakfast

Abstract: The purpose of this experiment was to determine the presence of iron in breakfast cereals using a magnet to separate the iron from a crushed mix of the cereal. The amount of iron was then weighed.

Project Number: SCH005

Grade: 9

Title: Mine Acid Neutralization

Abstract: Open limestone channels are a passive treatment option for neutralizing the pH of acid mine drainage contaminated water, however the neutralization rate is slow compared to more expensive, active treatment systems.

This project evaluated the impact of limestone particle size (from 2380 to 63 microns) and sample mass on the neutralization rate of sulfuric acid acidified water and the susceptibility of the limestone to armoring. The performance model developed from this work indicates that a 30% reduction in limestone particle size would more than double the acid neutralization rate, while also reducing the impact of armoring on sustained neutralization performance.

Project Number: SCH006

Grade: 11

Title: Must It Rust?

Abstract: --Did you ever see something metal that looked corroded? Well that's what motivated me to do this experiment. I wanted to find a way to prevent this corrosion or rust. I knew there were products in stores that claimed they can prevent rust on all metals. So I bought Rust-Oleum Rust Inhibiting Spray to test this. My hypothesis is that the different types of metal will rust in the different substances. I predict that the uncoated metals will corrode the most.

Project Number: SCH007

Grade: 11

Title: Emerald Envy

Abstract: I am going to attempt to make a jem, an emerald. I understand that the following will be a project to do, but I am more than willing to try. Will I succeeded in making an emerald? Will I make a big emerald? Will I make a small emerald? I tried getting the silica gel into a liquid form, in a few different ways. My first way I tried melting the silica gel that did not work. I tried ethyl alcohol, that did not work, and I tried crushing it, that did work. I was not successful in making an emerald because my procedure did not work, but I am going to try a new procedure.

Project Number: SCH008

Grade: 9

Title: Kimchi Chemistry

Abstract: Kimchi is a Korean fermented cabbage dish. This project determines chemical changes that are present during the fermentation of Kimchi. The chemical changes during the fermentation process can influence the taste of the Kimchi. After fermenting 5 sample of cabbage with appropriate spices, the data collected were averaged and included the color, the pH levels, glucose levels, and the temperature of the room where all the tests were taken. Kimchi samples with more liquid showed a lower pH than the other samples.

Project Number: SCH009

Grade: 11

Title: Cooking's Effect on Vitamin C Retention

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

Project Number: SCH010

Grade: 12

Title: LC-MS Analysis of Vitamin E

Abstract: Vitamin E is an essential antioxidant, found in various forms, that protects against the cell damages caused by free radicals. Most manufacturers claim 200 international units of vitamin E, although the recommended daily value is only 100 IU. My experiment was designed to determine the amount of vitamin E in various brands of supplements using LC-MS, compare the amounts among the other brands, and calculate the cost efficiency. Based on my results, all tested brands contained similar amounts dl-alpha tocopherolacetate. The most cost efficient brand was found to be Giant Eagle and the least cost efficient to be Western Family.

Project Number: SCH011 **Grade:** 10

Title: Which Insect Repel Red Mono STR?

Abstract: The purpose was to determine if insect repellent determinately affected the strength of fishing line. I hypothesized that 100% DEET would affect it most followed by Ultra Thorn Then Off then Bio UD and lastly Bite Blocker. I Soaked 90 pieces of line in each repellent, 30 for 24 hours 30 for 48 hours and 30 for 72 hours, then placed them on my testing apparatus and added Weight until they broke. The data Partially supported my hypothesis, the DEET affected them the most followed by Off and Ultra thorn, but the Bio UD and Bite Blocker made the line stronger.

Project Number: SCH012 **Grade:** 11

Title: Blue's Clues

Abstract: The gem i tried making is called Cyanotrichite. It's a translucent bright blue crystal clusters. It's a product of copper mineralization in a weathering environment with alot of Aluminum and Sulfate. When i mixed Copper Sulfate and Aluminum Hydroxide togher Cyanotrichite will hopefully form. I took 5g of Copper Sulfate and mixed it with 50mL of distilled water. I also mixed 5g of Aluminum Hydroxide with 50mL of distilled water and then combined the two mixtures together. In conclusion, i was unable to successfully form Cyanotrichite in time for the first science fair i participated in. But i will continue my research and fix any errors that may have ocured during my first attempt.

Project Number: SCH013 **Grade:** 10

Title: Testing the feasibility and efficacy of home-made biofuel

Abstract: The vast majority of vehicles in the United States run on fossil fuels, which are polluting, non-renewable, and are believed to contribute to global warming. Biofuels, particularly biodiesel, may provide an alternative to the use of fossil fuels. This project seeks to determine which biodiesel is most suitable for use in vehicles, as determined through comparisons of energy content, viscosity, and pollution of each fuel. The results show that certain biodiesels are indeed cleaner, more efficient, substitutes for diesel fuel, with different biodiesels more effective in differing conditions.

Project Number: SCH014 **Grade:** 11

Title: Easy On Easy Off

Abstract: Nature provides inspiration for enhanced control of adhesion from examples like geckos, spiders, and lizards. Geckos can climb on the ceiling, and move very fast. Their setae have a lot of fine fiber-like structures. The special orientation of the fibrils allows setae to release from a contacted surface easily. In this study, the effect of different adhesives with shear thinning properties has been investigated to make adhesion systems with easy-on and easy-off property. The results can be used as guidelines to design a strong but easy to remove adhesion system. The application is especially useful in a robotic gecko system that relies on small angle adhesion and detaching for movement.

Project Number: SCH015 **Grade:** 11

Title: Green Machine

Abstract: the purpose of my project is to make a synthetic Phosphophyllite crystal . it is a pretty rare crystal that is made from zinc,iron,phosphate,and water.

Project Number: SCH016 **Grade:** 9

Title: The Burn Rate of Hair Products

Abstract: The purpose of this experiment was to determine different flammability rates of hair products. To test this I timed how long it took for the recommended amount of hair product to catch on fire and how long it burned. All four products (Tresemmé Mousse,Tresemme Hairspray (Manual Pump) Tresemme Hairspray (Aerosol Can) and Herbal Essence Hairspray) ignited immediately, with Tresemme Hairspray Manual Pump taking the longest to extinguish. Thus not supporting my original hypothesis.

Project Number: SCH017 **Grade:** 10

Title: Toilet Paper Project

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

Project Number: SCH019 **Grade:** 12

Title: Fresh Water from Industrial Wastes

Abstract: Many industries produce waste in the form of diluted inorganic salt solutions. Two years ago, I showed that such solutions can be converted into pure sodium hydroxide using an electrolytic cell equipped with a cation-

exchange membrane. In this year's work, I used a three-compartment electrolytic cell equipped with both cation-exchange and anion-exchange membranes to remove all ions from aqueous wastes to form acids in the anode chamber, bases in the cathode chamber, and pure water in the middle chamber. This approach can also be applied to the desalination of sea water.

Project Number: SCH020

Grade: 12

Title: No Bones About It

Abstract: The purpose of this experiment is to determine what type of liquid will help a chicken bone decompose the fastest in a three week time period. Bones will be weighed before they are put in either water, diet Pepsi, diet Coke, Sodium Hydroxide, or Hydrochloric acid. Every 3-5 days the bones will be removed from the liquid and weighed to determine how much bone matter is lost.

Project Number: SCH021

Grade: 9

Title: Acid Mine Drainage Recovery

Abstract: If the pH of an acid mine drainage water sample is neutralized using a natural base, 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 natural bases were tested to determine if the bases reversed the harmful effects of acid mine drainage. I tested the water's 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: SCH022

Grade: 11

Title: Coolant Temperatures

Abstract: Which coolant will keep the lowest temperature in a running motor? It is hypothesized that the Prestone brand coolant will keep the coolest based on personal experience. A brief procedure of the experiment is as follows. Fill coolant system with new Peak brand coolant, and with the cap still off insert thermometer tip into radiator. Next start the motor and keep watch on four different time intervals. Record the ending temperature at the end of each minute. After engine is cool, drain cooling system and refill with the next brand of coolant.

Project Number: SCH023

Grade: 12

Title: Nasa versus the Internet

Abstract: The purpose of my project is to determine the best amateur rocket propellant practically speaking as well as from a pure power stand point. I hypothesize that the amateur APCP blend will prove to be the best fuel in regards to the projects testing procedures. I will determine the results of the tests through the use of a simple calorimeter as well as a force measuring device. The practicality will be determined by recording in detail the creation of and launching of the motors in a test rocket designed specifically for these tests.

Project Number: SCH024

Grade: 11

Title: Antioxidant Capacity of Teas

Abstract: This experiment determines which kind of tea has the greatest antioxidant capacity: green, black, or white tea and compares the tea's antioxidant capacity to ascorbic acid. The FRAP assay was used to measure the antioxidant power by using the antioxidants as reductants to reduce Fe(III) to Fe(II) which is binded with TPTZ. The absorption is measured before and after being in a water bath for four minutes. This directly relates the change of absorbance to the total reducing power of the antioxidants present in the reaction mixture. From my statistical testing, Salada white tea had the greatest antioxidant capacity with a FRAP value of 37.1 per one gram of tea followed by black and green teas. All of the teas had a greater antioxidant capacity compared to the ascorbic acid.

Project Number: SCH025

Grade: 9

Title: Water Hydrolysis Variables

Abstract: My purpose is to investigate the process of the electrolysis of water and determine the influence of voltage, electrode material, and the water electrolyte solution. My procedure will go as the following: I will test different electrode materials (copper, aluminum and steel), in different water electrolyte solutions (salt concentration, tap water, distilled water). Data observations and measurements will consist of collecting gas products within inverted containers over the cathode and anode.

Project Number: SCH026

Grade: 10

Title: Amount of Sugar in Fruit/Veg for Athletes & Diabetics

Abstract: To check the sugar levels in different fruits and vegetables at different levels of ripeness to determine which level of ripeness is best for an athlete or a diabetic to consume.

Project Number: SCH028

Grade: 9

Title: The Acidity in Candy

Abstract: This experiment was to determine which hard candy has the most acidity. Place one Lemonhead into 125mL of water. Let sit in the water to dissolve. Pour 1 teaspoon of baking soda in water. Do this with Lemonheads and Gobstoppers. The first trial of the Lemonheads 6 centimeters was covered with bubbles. The second trial 5.5 centimeters was covered. The third trial 6.5 centimeters was covered. The first trial of the Gobstoppers 3.5 centimeters was covered, the second trial 3 centimeters was covered, and the third trial 2 centimeters was covered with bubbles. In conclusion Lemonheads had more acidity than the Gobstoppers.

Project Number: SCH029

Grade: 10

Title: Analyzing Antioxidants

Abstract: In order to compare the supplement formats of antioxidants vitamin C, polyphenols, and alpha lipoic acid, their effectiveness was tested by their ability to prevent the radical phase of the Briggs-Rauscher reaction. This was evaluated by the length of time the radical phase was extended as a result of the antioxidants. The data collected revealed that the polyphenols were the most effective, along with the combinations of polyphenols with alpha lipoic acid and polyphenols with vitamin C. Antioxidants have important medical applications, and are their abilities to prevent a wide variety of diseases, including cancer, are currently undergoing extensive study.

Project Number: SCH030

Grade: 10

Title: Which type of detergent has a better effect on clothes?

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

Project Number: SCH031

Grade: 11

Title: Don't Kid With Kidney Stones

Abstract: I'm trying to determine if it is possible for kidney stone to be produced without the elements and environment of a human body.

Project Number: SCH032

Grade: 11

Title: Nutrition Labels: Fact or Not

Abstract: This experiment measures the sugar content in five different apple juices and compares this measurement with the amount stated on the nutrition label. The hypothesis being presented is when several apple juices are tested for their sugar content; they will be the same as what their nutrition labels claim. A homemade hydrometer and calibration curve will be used to determine the amount of sugar in each juice. The hypothesis was proven incorrect due to improper information on the labels or an error in the experiment. It was determined that the measured concentrations were not higher than what the labels claimed.

Project Number: SCH033

Grade: 12

Title: Rhodochrosite: Mined Dry

Abstract: The purpose of my experiment is to chemically recreate gem quality Rhodochrosite because the last of it was mined dry 5 years ago in Colorado. The procedures I used vary, including a homemade CO₂ chamber, a steam autoclave, and distillation. The data I collected was insufficient enough to make a reasonable conclusion about my project because it is still on going. The project is still in process and I can not make a conclusion yet.

Project Number: SCH034

Grade: 10

Title: Sapphires

Abstract: To make a synthetic sapphire by heating a mixture of Aluminum Oxide and Titanium Dioxide to about 2100 °C (3812 °F) in a kiln.

Project Number: SCH035

Grade: 11

Title: Does an Apple a Day Really Keep the Doctor Away?

Abstract: The purpose of this experiment is to evaluate the popular adage, "An Apple a Day Keeps the Doctor Away" and to discover why lemons temporarily stop the oxidation of apples. When apples are cut and exposed to air, they turn brown. A common way to prevent this is by squeezing lemon juice over them. I aim to find whether it is a high concentration of Vitamin C in lemons that stops apples from oxidizing, or something else entirely. If a large amount of Vitamin C is present, should the cliché instead be, "A Lemon a Day Keeps the Doctor Away?"

Project Number: SCH036

Grade: 11

Title: Bio-Diesel Titration

Abstract: Bio-Diesel is defined as a clean burning fuel made from domestic, renewable sources. Many steps need to be taken to produce the bio-diesel, one includes neutralizing used vegetable oil. Which base is most efficient in the removal of fatty acids from used vegetable oil? Sodium hydroxide and potassium hydroxide were tested for efficiency in neutralizing used vegetable oil. The vegetable oil was neutralized following the procedure of a standard titration, with the goal of finding the amount of base it took to neutralize the oil. Data collection shows that NaOH was more efficient in neutralizing the used vegetable oil.

Project Number: SCH037

Grade: 11

Title: Cells: Shrink/Grow in Saltwater Solution

Abstract: The purpose was to determine whether different types of cells will shrink or grow when placed in a saltwater solution. Initial observations of the Elodea, onion, cheek cells were made under a microscope. Equal amounts of sodium hydroxide and hydrochloric acid were mixed to create saltwater. Observe the cells after being placed in saltwater and record. All cells grew in size. All had higher salt concentrations than the saltwater, which would make water go into the cells, thus growing in size.

Project Number: SCH038

Grade: 10

Title: Is fast acting the fastest?

Abstract: The purpose of this experiment is to determine what type of pain reliever dissolves the fastest. Samples of pain relievers were dissolved in lemon juice and distilled water. It was determined that regular strength dissolved faster than extra strength followed by rapid release gels and finally arthritis pain formula aspirin.

Project Number: SCH039

Grade: 11

Title: Biofuels: Fuel of the Future

Abstract: The purpose is creating biofuels and comparing their qualities to fossil fuels to predict whether biofuels can replace them. Biodiesel from Vegetable Oil is cheapest biodiesel, is purest, has highest specific heat, and contains most energy. Biodiesel is viable replacement for diesel since it is renewable resource. Ethanol has comparable specific heat to gasoline and is relatively cheap, making it a viable replacement for gasoline.

Project Number: SCH040

Grade: 11

Title: Vitamin C With Oranges

Abstract: My project was to test to see when microwaving oranges if it would destroy the vitamin C. I was trying to find the effect of cooking both microwave and conventional has on the effects of vitamin C. My hypothesis was that when microwaving oranges it would destroy the vitamin C more than the conventional would. I took oranges and cooked them both in the microwave and conventionally and the microwaved one had a significant amount less of vitamin C levels than the conventional did. I tested the vitamin c Using the iodine and starch test.

Project Number: SCH041

Grade: 9

Title: The Best Insulator

Abstract: The purpose of this experiment was to determine which material prevented boiling water from losing heat the longest. The materials used were made of glass, clay, plastic, and foam.

Project Number: SCH042

Grade: 12

Title: The Rave About Glow-Sticks

Abstract: Glow-sticks are a universal form of light used in dangerous situations everyday. To create brighter longer lasting glow-sticks. Original experiment did not work. Need to isolate experiment from oxygen by creating a oxygen free environment (make reaction happen in a tube). With the isolation of oxygen I can make a brighter long lasting glow-stick

Project Number: SCH043

Grade: 10

Title: Acetone as a Chem. Solv.

Abstract: The purpose of this experiment is to determine the most logical choice of nail polish remover for use based off of efficiency, product cost, and potential harmful effects. The 100% acetone remover was the most efficient in removing nail polish from artificial nails. The two acetone removers followed, and then the two non-acetone removers. Based on research, acetone has many harmful effects. The conclusion therefore was that the Equate non-acetone brand was the most logical choice because of its close efficiency to acetone without the harmful effects.

Project Number: SCH044

Grade: 10

Title: Latent Fingerprints

Abstract: Chance fingerprints may be found on every type of surface of contact and when they are latent. The type of surface on which latent prints are to be developed is one of the most important factors when a choice for development method is made. Fingerprints are reliable sources of evidence in a crime. Due to the characteristics of skin, however, it is hard for the investigators to easily point out a suspect. Many techniques are used to locate prints from various locations, although black powder is the most common. The prints in this experiment were most evident when exposed for freezing temperatures. The print exposed to a heated environment were less visible, but preserved enough to pick a suspect out. Although, the prints were hardly noticeable when buried underground. The ridges of the fingerprints make it easier for a crime scene technicians to identify the suspect in a crime.

Project Number: SCH045

Grade: 12

Title: Leaching of Plasticizers into Bottled Water

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

Project Number: SCH046

Grade: 10

Title: Photoelectric Effect

Abstract: The experiment was designed to recreate the photoelectric effect using common classroom instruments. If the recreation was successful, the relation between testing materials and resulting currents would be farther tested. The open electroscope showed slight result as black light was shone to the metals. The differences between currents are too insignificant to measure.

Project Number: SCH047

Grade: 11

Title: A Colligative Property and De-Icing Chemicals

Abstract: This research is designed to study the relationship between the dying process of algae and oil production. My previous experiment shows that less healthy algae produced more lipids due to algae counter acting the dying process. In this experiment NaCl will be used in 1%, 3%, and 5% concentrations in H₂O with algae. Three samples for each concentration will be tested. One sample from each concentration will be taken out each day and have the lipids extracted. The hypothesis is the higher concentration of NaCl and longer time period, the more lipids produced from algae.

Senior Computer Science / Math

Project Number: SCM001

Grade: 9

Title: Prevention of Side Channel Attacks in EC Cryptography

Abstract: This project is an algorithm to prevent side channel attacks including timing, probing and fault attacks. It uses Java ME SDK 3.0 and is resilient and fast.

Project Number: SCM002

Grade: 9

Title: Analysis of Protein Structure using Computational Methods

Abstract: By applying the effects of variations in the nodes & their respective correlation coefficient thresholds, we can plot the motions in the amino acids of Cytochrome-C. This will enable us to understand the characteristics and motions of two states of the protein: reduced and oxidized. It will also aid us to understand and predict the overall structure of protein. Further, this method will provide guidelines for altering the protein for pharmaceutical purposes, and creating new drugs. This approach has successfully identified correlations in the protein, and provided analytical information regarding the functionality of Cytochrome-C in both reduced and oxidized states.

Project Number: SCM003

Grade: 9

Title: Intelligibility of Synthetic Speech

Abstract: My experiment was designed to test the intelligibility of three speech synthesizers. This can be helpful primarily for blind individuals who need a screen reader to work on the computer. I tested three synthesizers: eloquence, sappi 5, (Microsoft Sam,) and Realspeak, (Tom). Using a laptop, I tested eighteen people one on one. They each listened to three short stories, one using each synthesizer. I asked them ten corresponding comprehension questions following each story. I tallied each of their three scores out of ten on a table. The experiment concluded that the Realspeak synthesizer was the most intelligible, follow by sappi 5.

Project Number: SCM004

Grade: 9

Title: The Fibonacci Sequence Effect on Clarinet Harmonies

Abstract: The purpose of the experiment was to see if the Fibonacci sequence had an effect on clarinet harmonies. The two clarinetists assembled and tuned their instruments. Then they played sequences of notes in a concert B flat scale starting with C and ending at B. Out of the six note sequences predicted to harmonize, four of them did. Out of the fifteen note sequences predicted to produce dissonance, ten did. The correlation was not high enough to support the hypothesis. Therefore the hypothesis was not supported by the data.

Project Number: SCM005

Grade: 11

Title: Fourier Transforms and Complexity

Abstract: In order to test brute versus fast fourier transforms, I wrote a brute transform and used a fast transform written by a professor in the task of pattern matching. Written in C code, the brute transform was timed against the fast transform in different image sizes (ranging from 64 squared pixels to 1024 squared pixels). The brute transform was slower in every category. This proves that in the case of Fourier transforms, a lot of the time can be cut from the processing one is clever with coding; the algorithm design holds more value than simple mechanical computing speed.

Project Number: SCM006

Grade: 9

Title: Improved Drug Delivery in Treating Diseases

Abstract: Current treatment for cancer patients, diabetics, and those suffering with other such illnesses involve delivering drugs in a roundabout (and less efficient) fashion either orally or intravenously. Rather by implementing a smart targeted drug delivery system that relies on robotics (possibly nanotechnology) and computer principles, an increased amount of the prescribed drug will actually arrive at the site where its needed, thus potentially reducing medical costs for the patient and adverse side effects. I designed an efficient and effective system of targeted drug delivery using concepts in nanotechnology, robotics, and computer science that is applicable in treating patients.

Project Number: SCM007

Grade: 12

Title: Alternate Approximations to Solving Definite Integrals

Abstract: Numerical Integration poses a valuable option for functions which cannot be integrated. Today, Numerical Integration takes three main forms: Rectangular, Trapezium, and Simpson's rule. This project aims to build upon these techniques. This project incorporates arced geometric objects which are more custom fit for curved functions, a y base to provide for consistency in trapezoidal error, use of tangent points to secant lines, quadratic interpolation using more precise points, and radius of curvature. The newly devised methods are tested against functions varying in concavity, dy/dx , and amplitude, and finally a set of rules is formulated for implementing the techniques.

Project Number: SCM008

Grade: 11

Title: Pursuing Pascal: Banking on Blaise

Abstract: The purpose of the experiment is to determine whether or not there is a connection between Pascal's Triangle and the values from compound interest. The experiment will be conducted with simple pen and paper calculations. The initial values were related and exactly the same as those predicted by Pascal's triangle, but there is no specific trend as the values progressed. Therefore, it can be concluded that a small portion of the experiment was successful, but the majority deviated and was not applicable.

Project Number: SCM009

Grade: 12

Title: Agent-Based Data Distribution

Abstract: This project will look at the possibility of creating a framework that,utilizing intelligent, autonomous software agents, would be able to facilitate the movement of data between locations in both a distributed, networked environment and a local environment by independently removing logistical obstacles and by independently diagnosing and preventing data transfer problems.

Project Number: SCM010

Grade: 11

Title: Blackjack Card Count Program

Abstract: The purpose of my project was to create a program that could be used to show when the conditions were favorable for the player in a blackjack card game using several different options and card counting strategies. I created a Windows Form application that tracks and records user input to display the favorability for the player, while providing them with the optimal play when dealt a specific hand. While not legally allowed to be used in gambling institutions, my program can be used to increase one's card counting abilities and enrich their blackjack playing experience.

Project Number: SCM011 **Grade:** 11
Title: Liquid Efficiencies in Processor Cooling
Abstract: Liquid Efficiencies in Processor Cooling:

The purpose of this investigation is to determine which liquid inside the cooling loop provides the best cooling. Using a heat plate, Rocketfish CPU coolers, a fan, a fish pump, a thermocouple and tubing, a simulation of the heat of a processor was built. Water, Methyl Alcohol, Ethylene Glycol, Isopropyl Alcohol and Hydrogen Peroxide were all run through the apparatus and the starting and ending temperatures were recorded as well as the time to reach end temperature. Methyl Alcohol had the lowest end temperature, but a high time to get there. Water had the second lowest temperature with a low time to get there. Ethylene Glycol had the highest end temperature. Methyl Alcohol and Water performed best. Water cooled faster and was only 2 degrees behind Methyl Alcohol, so it is probably the best choice of the liquids used.

Project Number: SCM012 **Grade:** 10
Title: Classifying Irrational Polygons in Dynamical Billiard Systems

Abstract: Billiard theory attempts to describe dynamic systems known as billiards. Technically, billiard flow is the geodesic flow on a Riemannian manifold with a boundary. In layman's parlance, billiard systems are billiard tables where the ball is moving at a constant speed without energy loss. Much is known on rational polygons, meaning that all angle measures in radians are rational multiples of pi. However, it is still open whether all irrational polygons have periodic orbits (recurring flow). I classified irrational polygons to find periodic orbits, starting with triangles and generalizing to larger polygons. Billiard systems have applications in physics and chemistry.

Project Number: SCM013 **Grade:** 11
Title: Stop Light Calibration
Abstract: Please visit student's exhibit for the abstract.

Senior Earth / Space / Environment

Project Number: SES001 **Grade:** 10
Title: Does music affect plant growth?

Abstract: For my Science Fair project I am going to test to see if music affects plant growth. The materials that I am going to use are two plants, one song that will repeat constantly, two pots, radio. The plan is to have two plants of the same kind be in the same environment however, one of the plants will be exposed to two hours of classic music. I will do this test for a week and a half and see if there is any difference. I do think that the plant that is exposed to classical music shall grow faster

Project Number: SES002 **Grade:** 10
Title: Is organic fertilizer or chemical fertilizer better for plant growth?

Abstract: Finding out which is better for plant growth: organic fertilizer or chemical fertilizer? I hypothesize that the chemical fertilizer will be better for plant growth if it grows more than the plant using organic fertilizer. Materials: 2 pots and seeds, water, soil, chemical fertilizer, and organic fertilizer. Procedures: Fill 2 pots with soil, plant one seed in each of the pots, add in chemical fertilizer for the first pot and organic fertilizer for the second pot. I'm going to observe, record results each day, take pictures 2-3 times each week for 2 weeks and compare results in the end.

Project Number: SES003 **Grade:** 10
Title: Effects of Marcellus Shale on Creeks

Abstract: Obtain water samples from creeks near drilling sites. Test for dissolved solids, barium, pH, chloride and insect larvae.

Project Number: SES004 **Grade:** 10
Title: Chemical Effects on Ocean Life

Abstract: The purpose of this experiment was to observe the effects of different chemicals on ocean life, both plants and invertebrates, to represent the effects of point source pollution. I used two experimental groups and one control for each of the two tests I did. One test was with green algae, the other was with brine shrimp. I polluted them with Ammonium Chloride and Barium Nitrate in small doses. The green algae was affected by the chemicals but not killed, while the brine shrimp in both experimental tanks all died. This concludes that chemicals alter and harm ocean life.

Project Number: SES005 **Grade:** 10

Title: Disinfection By-products: Trihalomethanes

Abstract: This project was designed to test the effect of aeration on total trihalomethanes in chlorinated water. Four samples were tested (2 aerated and 2 non-aerated) and the results were compared. It was found that the aerated samples contained a significantly less amount of trihalomethanes than the non-aerated samples. The aeration process worked.

Project Number: SES006 **Grade:** 9

Title: Water Source Influence on Algal Survivorship

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

Project Number: SES007 **Grade:** 11

Title: H₂S-The Health Impact and Control

Abstract: Our air contains hydrogen sulfide gas. It can be an extremely toxic and irritating gas if inhaled beyond a certain limit. What is this limit, and how is the gas dangerous to our health? How is it generated? What is the chemistry behind it? This project emphasizes to answer these important questions. The H₂S released from a landfill next to a school was monitored by using detectors, and information was gathered for a couple of months before and after installing air filters. After a detailed study of adverse effect of H₂S on our health, this experiment concludes simple ways to control the H₂S gas emission in environment.

Project Number: SES008 **Grade:** 10

Title: Is Prsr Trtd Wood Envrmtly Safe

Abstract: The purpose of this experiment is to verify if "new" pressure treated wood (containing amine copper quardary) is more environmentally friendly than "old" pressure treated wood (containing chromate copper arsenic). Daphnia was introduced to water exposed to treated wood shavings. After a determined amount of acclimation, the Daphnia's heart beats were recorded for a specified time. The pulse was recorded for each Daphnia during exposure to each of the water samples. The water was analyzed for chemical content. Results will be presented to show whether the "new" treated wood is more environmentally safe than the "old" treated wood.

Project Number: SES009 **Grade:** 11

Title: Will NaF added to water effect daphnia?

Abstract: This project will investigate whether concentrations of NaF (sodium fluoride) typically found in runoffs from municipal water supplies effects the environment of daphnia species.

Project Number: SES010 **Grade:** 12

Title: Pharmaceutical-Flavored Water

Abstract: Throughout many metropolitan areas across the U.S., scientists have been carrying out studies to see if our water systems are contaminated with pharmaceuticals that come from either from unused medications that were disposed of by flushing them down a toilet or from the unabsorbed medications that are found in human urine. They have

done experimentation with the intent of filtering theses pharmaceuticals out. They have proved that reverse osmosis is not an effective filtration system for this purpose but have not done any major experimentation on common household filters.

Project Number: SES011 **Grade:** 9

Title: A Sticky Situation

Abstract: In my project titled "A Sticky Situation" I placed four types of gum, two sugar free and two non-sugar free, in three solutions of varying Ph. The solutions were vinegar, milk of magnesia, and a goo remover. I then placed each gum, in its specific solution, in either of the following environments; refrigerator, microwave, outside, and a control. I tested them periodically and recorded changes in color, size, and texture. My goal was to see which solution and environment dissolved the gum faster. The refrigerator delayed the breaking down and the goo remover proved most effective.

Project Number: SES012 **Grade:** 11

Title: Light Pollution

Abstract: Light pollution is quickly becoming a serious problem in the astronomical community. It harms the nocturnal wildlife, and threatens the population of many species. Globes and other wall-mounted, non-directional lights are a main cause of light pollution. but the focus of this project is light pollution cause by street lamps. Using a

light meter to measure the amount of light that street lamps waste, and a PASCO Sparkvue Unit to measure latitude, longitude, and relative humidity, light pollution was recorded to determine where there are optimal observing spots. All of the recorded data was entered into Microsoft Excel and saved as a text file. The text file was then imported into My World GIS where a map was created to show the amount of light pollution around Venango County.

Project Number: SES013 **Grade:** 9
Title: Light/Fertilizer Plant Effects
Abstract: Please visit student's exhibit for the abstract.

Project Number: SES014 **Grade:** 12
Title: Citizen Science with GalaxyZoo
Abstract: Humans are still better at doing some things than computers, and one of those is visual classifications. Scientists using the Sloan telescope have collected images of over 250,000 galaxies. In an effort to engage citizens in scientific research to classify galaxy types, they have created a web interface tool at www.galaxyzoo.org. This project will demonstrate how high school students with limited training can take part in the research and understand how the universe has evolved over time.

Project Number: SES015 **Grade:** 11
Title: Memory of Goldfish: Mind over Matter
Abstract: Please visit student's exhibit for the abstract.

Project Number: SES016 **Grade:** 11
Title: Can seeds purify grey water?
Abstract: The purpose of my experiment was to determine if Moringa and Willow seeds can remove detergent from grey water. I placed seeds into filters then into solutions of 5ml of detergent to every 1 L of water. I took an initial sample then took samples every 3 hours for 12 hours. Then 12 hours later I took a sample every 3 hours for 12 hours. I then took a sample every 12 hours for the next 10 days. I used a Spec 20 to test for percent transmittance of the samples. Seeds can be a cheaper method of purifying water.

Project Number: SES017 **Grade:** 9
Title: Nevermind the Optics - Listen for a Change
Abstract: Please visit student's exhibit for the abstract.

Project Number: SES018 **Grade:** 9
Title: How Does Fertilizer Affect the Hatch Rate of Brine Shrimp?
Abstract: The purpose of this experiment was to determine the effect of different amounts of fertilizer on the survival rate of brine shrimp. The information gathered from this experiment could show farmers how fertilizers are affecting the environment negatively.

Project Number: SES019 **Grade:** 9
Title: Beneficial Biosolids?
Abstract: Biosolids are domestic and commercial sewage and wastewater treatment used for fertilization and land reclamation. This project is aimed to find how biosolids affect groundwater and soil quality. Many controversies have arisen over the use of biosolids, human body wastes used as fertilizer or filler. Biosolids mixed with soil at different concentrations in a leaching apparatus were tested for pH levels, bacteria, and heavy metals in both water and soil, over a 2 week timeframe. Results in collections varied among samples of biosolids concentration.

Project Number: SES020 **Grade:** 9
Title: Effects of Fertilizer on the pH of Runoff Water
Abstract: Plant seeds in soil. Use organic and chemical fertilizers in soil. Observe plant health, height of runoff water and water pH.

Project Number: SES021 **Grade:** 9
Title: What is the Effect of Land Management on Deer Densities
Abstract: The purpose of this experiment is to discover the best land management technique for supporting large deer densities. Procedures used were scat pile count, trail count, track count, scrape count, and rub count in 3 transects in each land management type. The agriculture land management area held the highest deer density. The

urban farm had the second highest deer density. The Savage River State Forest was third highest. Big Savage Wildlands had the fourth. Dan's Mountain Wildlife Management Area had the smallest density of deer.

Project Number: SES022

Grade: 11

Title: Pond of the Dead

Abstract: Ponds are delicate ecosystems. Slight alterations could cause change. What could cause a pond to fail to support life? This experiment was conducted to detect the reason for the death of the pond. Chemical tests were conducted on the pond and the spring water (feeder). Bacterial assessments were made on the sediments. Physical parameters were measured. No chemical assessments were divergent enough from healthy pond parameters to indicate problems. The pond water was used in 96 hour toxicity test with *Daphnia magna* and *Hyalella* spp and indicated that the water was not a direct cause for the pond to die.

Project Number: SES023

Grade: 9

Title: Following the Rain

Abstract: There are many different types of surfaces on the ground weather it is grass, soil, or gravel. What I experimented was to see how all three of these surfaces interact with rainwater. First I took three planting troughs, drilled a hole at the end of each, and filled each with a different material. After that I poured the same amount of water into each one and let it drain out the other end into another jar. I chose this topic because it can be used to help figure out how to prevent disasters such as flooding.

Project Number: SES024

Grade: 11

Title: The Effects of Salinity on the Process of Bioremediation

Abstract: The purpose of this experiment was to test the effect of salinity on the process of bioremediation. The experiment was conducted over a fifteen day period, by combining precise amounts of oil, salt, water, and bacteria and making daily observations. This experiment yielded results that showed there was a correlation between salinity and the effectiveness of the bioremediation process. However, the results showed that the optimum efficiency of the process was done best at a low salinity concentration. The efficiency progression was low salinity, followed by no salinity, then medium salinity, and finally high salinity.

Project Number: SES025

Grade: 12

Title: Phytoremediation of the Xenobiotic Diphenhydramine

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

Project Number: SES026

Grade: 12

Title: BPA in Marine Systems

Abstract: Bisphenol A is an organic compound that is one of the main components used in polycarbonate plastics and epoxy resins. Because BPA is so common I tested to see if it would have an effect on marine ecosystems. I used sea urchin (*Stongylocentrotus purpuratus*) gametes to test my hypothesis. Data indicated that BPA, even in very minute concentrations (1mg/L and 0.1mg/L), has detrimental effects on the fertilization of sea urchin eggs.

Project Number: SES027

Grade: 10

Title: Which liquid will cool down the fastest?

Abstract: For my project I will be doing which liquid cools the fastest? I will be testing different liquids for example: water, different kinds of juices and pops I will also test tea, coffee, and lemon juice. My hypothesis is that water will cool the fastest. I will need thermometer, and different liquids to test it. I wanted to do this project because I was interested in which one will cool the fastest. Regular shoes and the other to play with cleats. I am testing and almost finished. my hypothesis was that it does effect the performance.

Project Number: SES028

Grade: 9

Title: Fertilizer/pH Effects on Algae

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

Project Number: SES029

Grade: 10

Title: Hairy Lettuce

Abstract: The purpose of the experiment was to discover if human hair, nails or horse hooves had an effect on the growth of lettuce plants. 16 cups were filled with soil, their keratin source, and three lettuce seeds. The plants were observed for one month and watered every other day. The final averages for the plants were 6 centimeters for the

hair source, 5/12 centimeters for the nail source, 3/12 centimeters for the hooves source, and 3 centimeters for the control. The results showed that hair had the most positive impact on the plants.

Project Number: SES030 **Grade:** 9
Title: Spiny Orbz and Magnetz
Abstract: Please visit student's exhibit for the abstract.

Project Number: SES031 **Grade:** 12
Title: Synergism - SDS & SuSO4
Abstract: Chemicals get introduced to aquatic ecosystems without first being investigated for their total effects, including how they will react with other chemicals present. Copper Sulfate, added intentionally (Copper Sulfate), and Sodium Lauryl Sulfate, added unintentionally (Water Quality), are both often found in aquatic ecosystems (Water Quality). LC50 concentrations of 1.8×10^{-4} mg/L of CuSO4 (Old Bridge) and 1.82×10^{-3} mg/L of SDS (MSDS – Science Lab.com) were administered to test groups of Daphnia magna both separately and together. A 96 hour toxicity test was performed. The results of statistical analysis using one way ANOVA did indicate a synergistic effect.

Project Number: SES032 **Grade:** 12
Title: Trash or Treasure?
Abstract: The purpose of this experiment is to take non edible waste products such as orange peels, grass clippings, and recycled paper and through acid hydrolysis, produce ethanol fuel.

Project Number: SES033 **Grade:** 9
Title: Soil Testing
Abstract: How much does the depth of an agricultural soil sample influence soil testing result? To test this question I collected agricultural soil samples from six different depths. I am looking for how long a chemical takes to seep down through soil levels and how long it takes to actually work and fertilize the soil. The soil samples were then tested for NPK nutrients. From my results I found that the deeper levels of soil contained more nutrients.

Project Number: SES034 **Grade:** 11
Title: Surfs Up
Abstract: Each year beach-goers notice changes in the shoreline, but what is the cause of this and can it be stopped? This project shows what can be done to prevent beach erosion. A beach will be simulated and will have different offshore structures. Waves will also be simulated for each of the offshore structures. The seaweed did the least to prevent the erosion. Then the pier did the second best in preventing erosion. Finally the off shore jetty did the best at limiting erosion. This experiment proves the more permanent the structure, the more it will prevent beach erosion.

Project Number: SES035 **Grade:** 10
Title: Mosquito Repellents
Abstract: Mosquito repellents containing DEET have been used by people for decades. However, repellents that contain DEET have also been proven to be harmful. Regardless, some people say that DEET is necessary in order for repellents to be effective, which is why I am testing this for my experiment. In this investigation, 200 mosquitoes will be raised in a large box with four sections. A small box will also be attached to the end and will hold the repellent. When exposed to the repellents, the mosquitoes movement patterns will be studied in order to determine which repellent is most effective.

Project Number: SES036 **Grade:** 10
Title: Astro Art
Abstract: Color composite images are important because it impresses more people to where they're more interested in reading about astronomies wonders. This experiment was conducted to compare different software's that produce color composite images. I will be using Aladin and MaxIM DL. I will be getting my information from internet resources.

Project Number: SES037 **Grade:** 9
Title: Fly Ash in the Face of Farmers
Abstract: Create different consistencies of fly ash to soil by mass. Add sunflower seeds to mixtures and allow them to grow for 20 days, measuring each day. Test soil after 20 days for metals using test strips.

Project Number: SES038

Grade: 12

Title: Go Green, Go Topless

Abstract: The purpose of the experiment is to determine how much landfill space could be saved if people were to take the caps off plastic bottles before throwing them away. Bottles were collected for two weeks just to see how many would be thrown out. Then the next two weeks the same group of people was asked to take the tops off their bottles. Out of all the bottles collected most had the caps taken off and when calculate if every school in the US did this millions of cubic feet of space could be saved from landfills.

Project Number: SES039

Grade: 9

Title: Radar Stealth

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

Project Number: SES040

Grade: 12

Title: P & N in Marine Systems

Abstract: To test the effects of phosphorous and nitrogen on the fertilization rate of *Stongylocentrotus purpuratus* gametes, separate experimental units were set up in blocks with 5mL of eggs re-suspended in ASW containing 2.0 x 10⁻¹ mg/L phosphorous, 8.0 mg/L nitrogen, both phosphorous and nitrogen, and control units with no additives. 30 microliters of diluted sperm was added to each unit. Fertilization rate was calculated. Results indicate that an excess of phosphorous and/ or nitrogen did have a negative effect on the fertilization. The excess of nitrogen had a positive effect with the rate of fertilization increasing by 9.65%.

Project Number: SES041

Grade: 12

Title: Pleiotropic Effects of HSP101

Abstract: Expose Arabidopsis seeds to high temperatures to determine effects on growth in plants with the heat stress gene HSP101.

Project Number: SES042

Grade: 10

Title: Cepheid Star XZ Cma

Abstract: Cepheid variable stars are used to measure distance to star cluster in our galaxy as well as more distant galaxies. XZ Cma is a Cepheid variable star in the constellation Canis Major. This study will use the R-COP Telescope in Perth Australia to determine the current variability period for the star, and compare it to previously reported periods. If the variability of the period changes over time, then the calculated distance to this and other Cepheids may be incorrect.

Project Number: SES043

Grade: 9

Title: Effect of Fly Ash on Grass

Abstract: My experiment determined how fly ash, a substance rich in heavy metals, affects the growth of rye grass. I mixed four concentrations of fly ash and soil together, and made a control of soil alone. Each concentration was represented by 30 containers, with three seeds in each. Fifteen containers per concentration level were watered every other day with distilled water, and the other fifteen with rainwater. The same day the plants were watered, I measured the growth of grass in each container. My hypothesis, that as fly ash concentration increases plant germination and growth will decrease, was partially supported.

Project Number: SES044

Grade: 11

Title: Identifying T Tauri Stars

Abstract: SBOS is a simplified method of identifying T-Tauri stars using small-scale optical telescopes. To date the method has only been used to distinguish T-Tauri stars from standard stars. AGN and active M dwarf stars emit excess in both infrared and H alpha, similar to T-Tauri stars. This study uses observations from the Kitt Peak National Observatory 0.9 Meter Telescope to further investigate the SBOS method and its true efficiency. The results of this study indicate that the initial efficiency claim of 70% is incorrect. Due to potential contamination by active M dwarf stars, the true efficiency is closer to 30%.

Project Number: SES045

Grade: 11

Title: Epsilon Aurigae

Abstract: My project of epsilon aurigae was started in order to facilitate a team of professional astronomers to decipher the mystery of the star. Throughout this project I used photographs to observe the change in brightness of epsilon aurigae, through out an approximate 3 month period. I then took my data and submitted it to citizen.org, allowing professional astronomers to add my data to their own observations to get a more precise idea of the mystery of epsilon aurigae. Although I constructed this observation, no conclusion was able to be drawn from the data.

Project Number: SES046

Grade: 11

Title: Greener Ways to Clean Our Rivers

Abstract: The purpose of my project was to test new, environmentally friendly methods of cleaning up oil spills on rivers and determine which is most effective. Four methods of oil remediation (leaving water untreated, adding a dispersant, using a bioremediation agent and combining both a dispersant and bioremediation agent) were tested in river water contaminated with motor oil for three, seven-day intervals. Afterward remaining oil was extracted using a consistent, predetermined method. The percent of oil remediated was calculated. Data indicated that the most effective method was using a dispersant and adding a bioremediation agent in degrading oil on water.

Project Number: SES047

Grade: 9

Title: Egg cellent Incubation

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

Project Number: SES048

Grade: 12

Title: Roundup, Half Life Killer?

Abstract: Non-target organisms exposed to pesticides are not supposed to be affected. The pesticide Roundup® was tested on amphipods after its half-life to determine if the half-life of the product is dangerous to non-target organisms. Sixty µL of Roundup® was applied to tubes containing soil. Water was applied to soil tubes as control. After seven days (the designated half-life of Roundup®), the soil was washed with 50 mL of water, the filtrate was collected, and was then tested with amphipods. Mortality rate was recorded at 24 hours and indicated that the half-life product of Roundup® is fatal to these organisms.

Project Number: SES049

Grade: 11

Title: Effect of Weed Kill on Bacteria

Abstract: The purpose of this experiment was to determine which herbicide will have the greatest effect on nitrogen-fixing organisms *R. rubrum* and *Anabaena*. Solutions containing 0%(control) 1%, 10%, and 20% of the herbicides Eliminator, Shultz, and Round Up were prepared and inoculated *R. rubrum* and *Anabaena*. Cultures were analyzed using a Spectrophotometer to determine the amount of absorbance after incubation for 24, 48, 72, & 96 hours. After 96 hours, nutrient agar plates were inoculated with solutions containing *R. rubrum* and incubated for 24 hours. Following this, colonies were counted. Upon analyzing data, Round Up had the greatest effect on the organisms.

Project Number: SES050

Grade: 10

Title: Estrogen in the Water

Abstract: The purpose of my experiment is to determine if *Pimephales promelas*, or fat head minnows, are affected by estrogen in the water and to observe and record these changes. To conduct my experiment, I will begin by obtaining fat head minnows and letting them live in a tank filled with spring water for about a week. I will then expose the minnows to estrogen (in the form of birth control pills) at about 5 nanograms per liter over the period of one month. The fish should develop external secondary sex characteristics. I will give the remaining fish to classmates and keep some in the lab at my school.

Project Number: SES051

Grade: 12

Title: Ponds, Glyphosate & Decomposers

Abstract: Glyphosate is a chemical found in herbicides. Samples of pond water containing leaves were tested to see if glyphosate would inhibit decomposition and therefore raise or lower the basic oxygen demand. Ten control units received no treatment while ten experimental units received a treatment of 0.09 mg/L glyphosate. The results show that there was a greater change in dissolved oxygen with the addition of glyphosate to the experimental units than in the control units. This means that the basic oxygen demand increased in the presence of glyphosate. A one-way ANOVA calculation was performed to find a p-value of <0.01.

Project Number: SES052

Grade: 12

Title: Up to my Head in Algae

Abstract: My project goal was to determine if there is a chemical difference between two connected ponds (A and B) to determine why there is a more significant amount of algae growth in pond A than in pond B. I took samples from both ponds and examined the average result of each chemical test for each pond to compare. I used measurements from a third pond source to compare a completely different water supply. I researched to find acceptable levels for each test I performed. There was little difference between pond A and B.

Project Number: SES053

Grade: 10

Title: Biogas to Biomass

Abstract: Biogas is the gas released from organic material. This gas is composed of methane, a flammable gas used as an energy source. Biomass can be in many forms of organic matter from a living organism such as manure. In this investigation, different types of manure were tested for CO₂ concentration, and volume. Carbon Dioxide was measured to determine the amount of methane given off during the anaerobic respiration. This information was then used to determine which types of manure were most energy efficient. Results showed a difference in the different types of manure and the methane concentration produced.

Project Number: SES054

Grade: 12

Title: Sunspots and Hurricanes

Abstract: The purpose is to determine if increasing solar activity linearly correlates with increasing Atlantic hurricane intensity. Obtain archive hurricane records, the month and maximum wind speed, for the 1954 to 2008 Atlantic Hurricane Season. Obtain archive average sunspot activity for 1954 to 2008. Calculate monthly average hurricane intensity. Conduct correlation test for each sunspot cycle correlating monthly average hurricane intensity and monthly average sunspot activity. There appears to be no correlation between the data for all solar cycles. My hypothesis wasn't supported by the data collected. A statistical correlation test confirms that the data in all solar cycles aren't related.

Project Number: SES055

Grade: 10

Title: Reclaiming Streams Affected by AMD

Abstract: This experiment was intended to see if a local stream supports a healthy macroinvertebrate population. It was chosen because it has different levels of pollution caused by Abandoned Mine Drainage. Leaf packs were used to observe the macroinvertebrate population within the stream and determine the water quality at each of 4 sites. I found that the macroinvertebrates are not affected by the pollution. All 4 sites were in the good or excellent water quality range and no statistically significant difference was observed. Future research is planned to observe the influence of the time of year on passive treatment systems.

Project Number: SES056

Grade: 12

Title: Permethrin in Ponds-Bad News?

Abstract: Pyrethroid insecticide run off is seen more frequent in water systems (Werner et al 2009). These harmful insecticides can have lethal effects to many aquatic organisms. This experiment tested the effect permethrin, on pond bacteria. An assay was conducted to enumerate the bacteria present in the pond water. The LC₅₀ at 96 hours was identified so that the sub lethal dose could be added to the experimental units of pond water. A final bacteria count was taken to compare to the original assay. Data indicates permethrin increased bacterial growth.

Project Number: SES057

Grade: 12

Title: The Effect of Simple Sugar on Yeast Fermentation

Abstract: This experiment was conducted to determine if different simple sugars added to yeast would generate different amounts of ethyl alcohol measured by percent change in mass. The ethyl alcohol that is produced then measured can be used as a different fuel source with a reduced amount of carbon dioxide exhaust.

Project Number: SES058

Grade: 11

Title: Does Cigarette Smoke Affect Plant Growth

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

Project Number: SES059

Grade: 11

Title: A Mystery: Epsilon Aurigae

Abstract: A rare and mysterious star system by the name of Epsilon Aurigae has stumped the astronomical world for several decades. Every 27 years, Aurigae is part of a lengthy eclipse with adoration of approximately 2 years. The long amount of time between the eclipses, tells the solar mass is 10-12 times that of the sun. Another piece of this mystery is that during the 2 year eclipse, the brightness of the star increases a halfway through the time period. It is accepted that there is a ring of dust around Aurigae that is causing the light to increase.

Project Number: SES060

Grade: 10

Title: De-icing Salts and Wheatgrass

Abstract: Which deicing salt (NaCl, CaCl₂, MgCl₂, KCl) or sodium acetate does the most damage to plants? The same mass of wheatgrass seeds was spread onto soil. Seeds were watered with 100mL each and left under a continuous light source. After 10 days, 1g, 5g, and 10g of each salt was added every day before watering. The final

average height of the control plants was about 20cm. Heights of the 10g sample for NaCl, CaCl₂, MgCl₂, KCl, and NaC₂H₃O₂ were 12cm, 13cm, 15cm, 15cm, and 15cm respectively. In addition, the 10g NaCl displayed more wilting, while MgCl displayed the least. Wilting in KCl and NaC₂H₃O₂ were similar. It can be concluded that typical rock salt does the most damage to plants.

Project Number: SES061

Grade: 9

Title: Chlorophyll As A Possible Energy Source

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

Senior Engineering / Robotics

Project Number: SER001

Grade: 12

Title: Mouth Mouse

Abstract: The purpose of this project was to design and fabricate a modified computer mouse, "Mouth Mouse". This mouse would solve the problem of quadriplegics not having independence while using the computer and allow them to talk while working. I started by researching the needs of my target population, existing adaptive mice, and how to design a computer mouse. After several constructions, I designed a joystick device that fit into a custom dental tray. My third construction was successful, but still needs more design work in order to achieve my goal of creating a mouse that is connected via a USB.

Project Number: SER002

Grade: 10

Title: Sound Projection In Classrooms

Abstract: Many variables can contribute to improving sound projection in classrooms. One variable is the shape of the room. This experiment compared the original structure of a classroom to an architecturally different structure to determine the better structure for sound projection. In the structure I made, I used a strong, durable, nonreflective material (wood). The structure was made to be able to replace the first wall of the classroom to improve sound reflection for data collection. Sound was emitted and bounced off of both architectural designs and the sound level in decibels recorded. Differences between the two designs were identified.

Project Number: SER003

Grade: 11

Title: Does shape or material affect sonar more?

Abstract: Test different shapes and materials to see which effects a sonar sensor more.

Project Number: SER005

Grade: 11

Title: Go Green With Light

Abstract: Architects and builders have the same challenges when selecting which type of lighting systems to install. The purpose of this experiment is to help these architects and builders determine which type of lighting is the most efficient. When architects design "greener" homes, they choose things like energy efficient windows, Heating Ventilation and Air Conditioning systems, and now lighting systems. In this experiment, different types of light bulbs were tested in terms of wattage, cost, and temperature in order to find the ultimate energy efficient light bulb that also provides good lighting with an architectural flair.

Project Number: SER006

Grade: 9

Title: Efficient extraction of energy from human motion

Abstract: Kids today often forget to charge their cellular telephones, music players, or hand held video game devices and are unable to charge them without being near an electrical outlet. However, whenever they are busy in school or in a car they have no outlets nearby. They have no way to charge their electronic devices. Although devices such as a flashlight that is shaken to charge exist, much more efficient and human compatible devices are this project's goal: e.g., a small band that is wrapped around the leg allowing for natural leg movement to efficiently produce energy. This energy can then be used to power an iPod, cell phone or other electronic device. In order to design a device that is well adapted to harvest energy from natural motion, the first part of this project was to measure the motion at various points on the body of a normal healthy human when walking, jogging, skipping, and sprinting using an accelerometer connected to a computer to capture the data. The second step in the procedure was to design and build an electro-magnetic energy generator whose mechanical properties are designed to efficiently extract energy from human motion. The basic device consists of movable magnets, springs, and electromagnetic coils. The last step in the project was to test the electrical energy generator and recording data on the electrical energy generated when a human subject is carrying out various normal motions.

Project Number: SER007

Grade: 11

Title: Are more Expensive Bullets Faster?

Abstract: The purpose of my experiment was to determine if more expensive bullets have a higher velocity. I tested three brands of 5.6x15mm rifle rounds and measured their velocity by using a ballistics pendulum that I made for this experiment. After analyzing the data I collected from the 60 trials per brand, I concluded that the Remington (7 cents per round) and the Wildcats (8 cents) both outperformed the least expensive bullet, the .22 ThunderBolt (4 cents). The more expensive rounds had an average velocity of 397.87 m/s and the ThunderBolts had an average velocity of 385.26 m/s.

Project Number: SER008

Grade: 10

Title: Operation Aquatic Rescue

Abstract: The goal of this project is to research which hardware architecture works best for an autonomous aquatic rescue robot. The NXT and Dragon12-Plus controllers are being compared. My experimentation includes Software and Hardware, and compares tasks to confirm which hardware will be capable of performing the crucial functions best for the robot. The experiment is to control a prototype jet assembly and be able to reverse, forward and turn. The results from this project will lead up to the ultimate autonomous aquatic robot project. In addition to open water rescues, this robot can perform rescue missions in flooded mines and caves.

Project Number: SER009

Grade: 10

Title: Torque is Cheap

Abstract: Previously I designed a wind turbine that demonstrated higher torque than conventional designs. I hypothesized that the wind shield could be redesigned to better direct wind into the turbine blades, improving efficiency by at least 30%. Positioning the wind shield at 40 degrees to the turbine increased the power generated by about 10%. Further, designing wider blades increased the power by about 30%. The combined effects of angulating the wind shield and incorporating wider blades increased performance by 40% over the initial design. My hypothesis was not supported, but additional design features enabled me to exceed the increase in performance.

Project Number: SER010

Grade: 11

Title: Optimizing Infrared Detectors

Abstract: This project deals with the optimization of infrared detectors in an object detection configuration. Testing with an infrared emitter and detector circuit was intended to determine the optimal range for infrared detectors to detect a variety of materials objects might be constructed from, as well as to determine the impact of different light sources on detection. Lighter materials were more easily detected than darker materials; detection increased as ambient light was reduced, and the optimal range of detection proved to be within three feet of the detector. This type of research could be a basis for robotics research in exploration.

Project Number: SER011

Grade: 10

Title: Orientation of Wind Blades vs. RPM

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

Project Number: SER012

Grade: 10

Title: Tactile Sensor for Artificial Vision

Abstract: There are 21 million visually impaired Americans. Almost half live below the poverty line. Guide dogs and bionic eyes are the primary assistive devices available but are very expensive and thus not affordable options. In this project I built an assistive device that provides a low resolution tactile imagery and which can be produced under \$500.

Project Number: SER013

Grade: 11

Title: The Retriever

Abstract: Robots can greatly reduce the need for humans to perform tedious tasks. The goal for this robot is to autonomously retrieve tennis balls. With blob detection, the robot will be able to identify the ball. The robot's simple yet functional design will allow it to approach and retrieve the tennis ball. It can successfully recover about 75% of the balls on its first try, and within the second or third try it will leave the area free of tennis balls. A more sophisticated robot of this type can completely eliminate the necessity for humans to pick up tennis balls.

Project Number: SER014

Grade: 11

Title: Mapes (Motion Activated Pest Elimination System)

Abstract: The engineering goal was to address the problem of an insensitive triggering mechanism in today's mousetraps by creating a mousetrap that is triggered by a motion detecting eye instead of by a metal pan. The goal

was approached by acquiring one mousetrap and one motion activated air freshener and taking the active parts from the trap and the chipboard from the air freshener and combining them in a piece of 2x4 lumber. After testing it was found that the electric trap triggers much more reliably than its low tech counterpart with a 74% increase in triggering sensitivity.

Project Number: SER015

Grade: 9

Title: Effortless Clarity System on the Road

Abstract: The system consists of a sensor, a microprocessor, and a signal conditioning circuit. First, the sensor will detect moisture and send the signal to the microprocessor. The microprocessor will send an output signal that will be sent to the analog signal conditioning circuit and the head lights. This signal conditioning circuit will transform the output signal of the processor into a voltage that actuates the motor, for the windshield wipers. This is a repetitive process to maintain a clear windshield until sensor stops detecting moisture. Altogether this program creates an affordable automatic windshield wiper with a cost around \$60.

Project Number: SER016

Grade: 12

Title: Variations in Plectrum Tones pt. 2

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

Project Number: SER017

Grade: 11

Title: Solid State Relays in the Home

Abstract: The experiment will determine if solid state relays that control lights and electrical outlets could be controlled by a desktop computer.

Project Number: SER018

Grade: 9

Title: Channeling Hydroelectric Power in a Rain Barrel

Abstract: The purpose of my engineering project is to study the force of water and, in turn, the electric current generated when adding a hydroelectric generator to a rain barrel. The engineering goal of my project was to create a generator in a rain barrel. I obtained a 757 liter rain barrel, and then began to construct a micro-hydroelectric generator. After going through my procedure, an average current result was obtained with a multi-meter. I then took my project a step farther and see if it could be applied to my home's power grid.

Project Number: SER019

Grade: 11

Title: Does Fly Ash Reduce Concrete Strength?

Abstract: My experiment was to determine how fly ash affects the strength of concrete, when mixed with cement and sand. I hypothesize that out of three test groups, the one with the most fly ash would be the strongest. I cut pvc pipes into cylinders for each of my three test groups and poured concretes with different mixtures of fly ash into them. I tested the strength of the cylinders after they dried by suspending the concrete cylinders, and hanging a bucket off of them and filling it with sand. I weighed the sand after each test. My hypothesis was correct.

Project Number: SER020

Grade: 10

Title: Wi-SPY

Abstract: The purpose of this project is to develop an airborne surveillance system that will assist in surveilling deer movements and habits without disturbing their natural tendencies. I plan to do this by making a lighter than air craft using helium filled balloons and radio frequency (RF) controlled propulsion motors. The craft will be equipped with a miniature audio/video (AV) camera that will transmit directly to a base computer station for tracking purposes.

Project Number: SER021

Grade: 11

Title: Opatron II

Abstract: The purpose of this experiment is to improve the Opatron by giving it the ability to pick multiple strawberries and store them efficiently. In order to achieve my goal, I created vision and proximity algorithms to detect strawberries surrounding the robot in a strawberry patch. The robot can now detect many strawberries and move to the closest strawberry, pick it, and store it. The robot then proceeds to repeat the process and pick the next closest strawberry. Ultimately, the Opatron is a way to reduce human labor in agricultural fields.

Project Number: SER022

Grade: 11

Title: Absorption of Fluorinic Compounds

Abstract: Where in a bathtub pipeline system does a coconut husk filter need to be placed to most effectively remove fluoride from water? To address this problem, a coconut husk filter was placed in four different locations in a

bathtub pipeline system. Fluorinated water was filtered through the pipeline to find where a filter must be placed for maximum effectiveness.

Project Number: SER023

Grade: 9

Title: Tesla Turbine: Water vs. Air

Abstract: The purpose of the experiment is to find whether water or air will generate more revolutions per minute on a tesla turbine. The turbine was constructed using 5 CDs, a coat hanger, a spindle, a flat piece of plastic, and a dome to cover the apparatus. A slit is cut in the center of the dome to insert a nozzle which will be attached to a water and air source separately. The PSI was determined for each the water and air source. It was determined that the air source allowed the turbine to rotate faster.

Project Number: SER024

Grade: 11

Title: Stirling Engine Efficiency

Abstract: The purpose of my experiment is to build the most efficient Stirling engine possible, I plan to do this with a homemade Stirling engine that will turn an AC generator to heat a piece of nichrome wire and create a larger temperature difference so the Stirling runs engine more efficiently. I will do this to see how much electricity can be obtained from a small generator at different speeds, and extrapolate the graph to see how fast the engine would be at maximum efficiency. After many attempts I was unable to build a working engine and unable to collect results.

Project Number: SER025

Grade: 9

Title: Mousetrap Cars

Abstract: Mousetrap cars are an example of a simple machine. I conducted an experiment on mousetrap cars. I tested two different models to see which one worked best. I am interested in engineering. That is why I chose this project. I built my own cars and tested them in the street. The car with all power to one axel went the farthest by two feet. therefore my hypothesis wasn't supported. In the future I may test different designs to truly see which works the best.

Project Number: SER026

Grade: 9

Title: Cost Efficient Windmill Design

Abstract: In many areas of the country, windmills are not economically viable because the initial cost is too high. If windmills could be made inexpensively, then they could be utilized in marginal areas. I will test windmill blade designs made from common inexpensive materials.

Project Number: SER027

Grade: 11

Title: Automotive Photobioreactor

Abstract: In my experiment, I created an automotive photobioreactor. In the device, four jugs filled with algae are mounted on the car's roof. Exhaust is bubbled through the algae, which converts some of the CO₂ into O₂. To test the device, I measured the photobioreactor's effects on the CO₂ content of the car's exhaust and the impact on the car's fuel efficiency. CO₂ content was reduced by 28%, while fuel consumption increased by 7%. Using these results, I found that the device causes a net emission reduction of 23%. Therefore, the photobioreactor is a feasible option for reducing automotive CO₂ emissions.

Project Number: SER028

Grade: 11

Title: What's the Password?

Abstract: Passwords are the single most important key to keeping all of your personal information safe on your trusted computer. The tools to test your own system are open to the public and anyone can use them. But they must be applied correctly in a non malicious manner. Large companies look for people to test their security so the risk of information theft can be eliminated. This has really inspired me to see if I can test my own system for its security and put some of my own changes to the process.

Project Number: SER029

Grade: 11

Title: Mechanical Broadheads

Abstract: Which design of mechanical broadhead will deploy its blades to the largest entry wound on average. The Slip Cam will open its blades the most. Fire the broadheads into blocks of ballistic gelatin and measure the diameter of the entry hole. The data supported the hypothesis. The Slip Cam style broadhead opened its blades to the largest entry wound on average as compared to a traditional expandable.

Senior Medicine / Health / Microbiology

Project Number: SMH001 **Grade:** 12
Title: Light Influence on Stem Cells
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH002 **Grade:** 11
Title: Safe Toothbrushes
Abstract: Bathrooms can be contaminated with several types of bacteria many of which come in contact with other items in the room. Objects such as toothbrushes can be exposed to airborne bacteria when not in use. One species of bacteria commonly found is Escherichia coli. The hypothesis was there would be a lower growth rate of E. coli on translucent toothbrushes than on opaque ones which provide dark conditions (Glass, R.T.). The purpose was to test this hypothesis. No statistically significant difference was observed. Therefore the type of toothbrush has little effect on growth of bacteria.

Project Number: SMH003 **Grade:** 10
Title: What exercises affect the blood pressure of teenage girls?
Abstract: The purpose of this experiment was to determine whether or not doing 30 jumping jacks raised the blood pressure more than regular exercise for 16 volunteers from the girl's soccer team.

Project Number: SMH004 **Grade:** 9
Title: Peptone UV Remediation
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH005 **Grade:** 11
Title: Clean Your Apples
Abstract: The purpose of my experiment is to find what bacteria is on apples and the best way to clean them from that bacteria. My procedure is to first make a pattern on a piece of paper. This stencil will be used to cut a pattern on the apple. After cutting the pattern out with a sterile knife and forceps, I gently stamped the apple onto the agar. Then I cleaned the piece of apple with a variable and stamped it again. Due to the weather, a teacher has not been able to give me proper instructions on statistical testing.

Project Number: SMH006 **Grade:** 12
Title: Short-term diet on Physical Performance
Abstract: The purpose of this experiment is to see what effect a short-term diet has on physical performance. I believe a short-term diet consisting mostly of complex carbohydrates will be most beneficial for physical performance. Four test subjects will be prescribed five twenty-four hour diets. During the twenty-fourth hour, the test subjects will exercise. Following the exercise the subjects' blood pressure and heart rate will be recorded. The subjects will answer a questionnaire about their overall physical state. The results will be compared- whichever short-term diet provides the least amount of increase in blood pressure and heart rate will be considered most beneficial.

Project Number: SMH007 **Grade:** 12
Title: Effects of Antifreeze on Chlorella
Abstract: To discover the toxicity of ethylene glycol antifreeze. No pattern existed between antifreeze concentration and chlorella absorption. Based on experimental analysis, no direct correlation exists between antifreeze concentration and chlorella absorption, as affirmed by a single-factor ANOVA statistical analysis.

Project Number: SMH008 **Grade:** 12
Title: Prescrip. vs Traditional Med.
Abstract: The experiment was designed to test if there exists a home remedy that is more effective at preventing the proliferation of Staphylococcus epidermis better than the prescription treatment Differin®. S. epidermidis is a common bacteria found in skin lesions known as acne. The effectiveness of the treatment was assessed by incubating bacteria, plating the bacteria on nutrient agar, and applying the treatments using the Kirby-Bauer disk method, followed by incubating for 24hrs at 37°C. My results indicate that there is a treatment more effective than the prescription.

Project Number: SMH009 **Grade:** 10
Title: Antioxidant Remediation of Oxidative Stressed Stem Cell Line
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH010 **Grade:** 11
Title: Vit C Attenuation of Yeast Mutagenesis
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH011 **Grade:** 10
Title: The Effect of pH on Drug Release
Abstract: Determine which pH has fastest release rate with aspirin. 1) Weigh out 0.400g of Acetylsalicylic acid, put in 125mL Erlenmeyer flask. Add 10mL of 1 M NaOH solution. Transfer to 250mL volumetric flask, dilute with distilled water to 250mL mark. This is "Standard Aspirin Solution." Transfer 0.5mL of "SAS" to 10mL graduated cylinder, dilute to 10mL mark with 0.2 M Iron(III) Chloride. Repeat with 0.4, 0.3, 0.2, and 0.1mL of "SAS." Measure percent transmittance of solutions with spectrophotometer set at 530nm. Use Iron(III) Chloride as blank. Repeat, replace NaOH with HCL, and H₂O. 2) Place 2 tablets of regular aspirin in crucible with holes, place on ring stand, suspend in shallow beaker of NaOH until tablets are completely submerged. Place beaker on electric stirrer. As soon as stirring starts take 0.5 ml sample of NaOH from beaker and take samples every five minutes. Take samples and put in 10mL volumetric flask, dilute with Iron(III) Chloride, run through spectrophotometer. Repeat, replace NaOH with HCL and H₂O. Repeat entire process with Buffered Aspirin and Enteric Coated Aspirin. Do process 3 times. NaOH did best for regular aspirin and buffered aspirin, H₂O did best for enteric coated aspirin.

Project Number: SMH012 **Grade:** 12
Title: PRP Influence on Human MDSC's
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH013 **Grade:** 9
Title: Radiation's Effect on Plasmid DNA
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH014 **Grade:** 10
Title: DHA Effects on UV Stressed Microbes
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH015 **Grade:** 10
Title: Breathing Circuitry
Abstract: The purpose of this experiment was to determine whether or not the age of an individual has an effect of their capacity of air they are able to take into their lungs.

Project Number: SMH016 **Grade:** 12
Title: Maggot Therapy
Abstract: Maggot therapy is becoming a more frequently used treatment in hospitals and clinics. Is it really effective as an antimicrobial? I hypothesize that water soluble substances extracted from macerated maggots will inhibit the growth of bacteria. To determine if these substances are effective at inhibiting the growth of bacteria, the extracted material was applied to sterile disks and placed on nutrient agar plates inoculated with Staphylococcus epidermidis and agar plates inoculated with Escherichia coli. Penicillin disks were used as a comparator. Data collected indicates that the extract of maggot is somewhat effective at inhibiting the growth of bacteria

Project Number: SMH017 **Grade:** 9
Title: Is the Combination of Anti-Rejection Drugs Synergis
Abstract: The purpose was to examine the effect of anti-rejection medications on immune cells when used singly and in combination. First, T-lymphocytes were separated from the blood samples of 10 people. FK-506 and rapamycin were added at different doses. The stimulation of lymphocytes was measured by the binding of three cytokines, IL-2, IFN-gamma and TNF-alpha; with fluorochrome-tagged antibodies. A flow cytometer was used to record each cell's expression of the specific cytokines. Both drugs caused the suppression of the cytokines. FK-506 was more powerful than rapamycin. The combination of drugs causes a significant decrease in cytokine expression. The medications are additive.

Project Number: SMH018 **Grade:** 10
Title: Soy Product Effects on Microbial Flora
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH019 **Grade:** 9
Title: Green vs Non-Green Cleaners
Abstract: In my experiment I am testing green cleaners against non-green cleaners using a bacterial halo system. The purpose of this experiment is to see which is the more efficient household cleaner. I will conduct my experiment using petri dishes, common household bacteria, and a few other necessary pieces of equipment. I will dispose of all potentially harmful objects at Mon-Valley Hospital, where they will sign a release form.

Project Number: SMH020 **Grade:** 9
Title: Factors Predicting Mortality in Acute MI
Abstract: During the last 15 years, health care professionals have sought to improve outcomes for patients with acute myocardial infarction (AMI). However little has been reported about factor which predict increased risk of mortality in AMI. In my study, I will analyze the effect of a patient's age, gender, insurance status, residence location, region in the U.S., hospital ownership, teaching status, and location, and secondary/additional diagnoses on the outcome of AMI. I hypothesize that older age, female gender, uninsured status, residence in rural areas, the southern U.S., nonteaching hospitals and hospitals in non-metropolitan areas will have an adverse effect on the outcome of AMI and that hospital ownership will have no such effect. I will collect mortality data from 2007 from an online database provided by the National Inpatient Sample, and statistical analysis will be tested by a Z-test.

Project Number: SMH021 **Grade:** 12
Title: Phat Mice
Abstract: This Experiment was chosen to see if Creatine Monohydrate and Centrum Silver (.05mL) can make you gain weight. In-Order to do this, I would need to use mice because they are easy to handle, you can pick them up, easy to weigh, you can notice the mass difference in the mice, you can also have a lot of them if you need. You have six different colored mice in a cage with bedding, food, and water. Two mice get fed Creatine Monohydrate and two get Centrum silver and two their regular diets. They got fed these supplements every two days for 30 days. The mice on Creatine monohydrate gained the most weight, the hypothesis supported the data.

Project Number: SMH022 **Grade:** 11
Title: To Wii or not to Wii?
Abstract: The purpose of this experiment is to determine the effectiveness of the Wii Fit games in improving balance. The subjects were randomly split into two groups. Each subject took the Wii Fit Balance Test. The "Wii users" used the same Wii balance game for 5 minutes each day. After the testing period, both groups were tested on their balance using the Wii Fit balance test again.

Project Number: SMH023 **Grade:** 9
Title: Effect of Smoking on Lung Capacity
Abstract: The purpose of my experiment was to show how smoking affects the breathing process and how it can lead to lung and heart damage. In my experiment, male and female participants exhaled into a balloon and I calculated the volume of the balloon. I also measured the subjects' lung capacity using a respirometer. The results support the hypothesis that non-smokers have larger lung capacity than those people who smoke.

Project Number: SMH024 **Grade:** 11
Title: Ethanol Effects on Murine MDSCs
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH025 **Grade:** 10
Title: DHA's Effects on Cancer Cell Cycle
Abstract: The experiment's aim was to determine where Docosahexaenoic acid (DHA) arrests the cell cycle of melanoma and squamous cell cancer lines. Cells plated in vitro were treated with varying DHA concentrations. Cell counts were conducted to determine effects on growth, while staining and flow cytometry determined the effects on the cell cycle. In the melanoma cell line, as the DHA concentrations increased, greater growth inhibition was shown by the accumulation of cells in S-phase but in the slower proliferating squamous cell line, the build-up of cells occurred in the G0/G1 phase, showing the points of arrest for this cell line.

Project Number: SMH026 **Grade:** 10
Title: Drug abuse knowledge and teens
Abstract: The purpose of this experiment was to test the drug abuse knowledge of teenagers by giving them a survey. Teenagers were surveyed at the high school and college levels.

Project Number: SMH027 **Grade:** 10
Title: Superbug Invades our Schools: Can We Stop it?
Abstract: The new superbug is Methicillin-resistant Staphylococcus aureus (MRSA), a bacterium that is resistant to many antibiotics including penicillin. The increased spread of MRSA in the community setting and in schools has caused many severe infections and deaths. Currently, universal surveillance is not recommended in schools; however, some hospitals have already implemented universal surveillance. This project examines whether universal surveillance and subsequent decolonization of MRSA will prevent MRSA infections in schools. Using a computer modeling program, the effects of performing surveillance were evaluated. After performing simulations through the model, the results showed that surveillance does prevent MRSA infections among students.

Project Number: SMH028 **Grade:** 11
Title: Analysis of Mycobacteria by a Lysogeny Assay
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH029 **Grade:** 11
Title: Colloidal Silver
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH030 **Grade:** 11
Title: UV Resistant E.coli
Abstract: The experiment was designed to find UV light resistant bacteria. Known quantities of bacteria were irradiated with UV light fifteen minutes at a time for three days at 254nm and the growth rate was measured and compared to a control. Five units were set up as control and five units exposed to UV. One hundred micro-liters of nutrient broth was added to the test plates and re-plated on clean plates to find living bacteria (UV resistant). Findings indicate that the amount and duration of the UV light had little effect on the bacteria.

Project Number: SMH031 **Grade:** 10
Title: Does Vicks VapoRub Affect Staph. epidermidis?
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH032 **Grade:** 11
Title: How pacing makes a bad heart better
Abstract: Myocardial infarction (MI), commonly known as heart attack, is caused by interruption of blood supply. External defibrillator, a pacing device, saves patient's life but how? I tested my hypothesis that pacing (BIV /or RV) affects molecular level of certain ion channels, which restores the function of MI heart. A small infarction was introduced in rabbit heart and it was paced continuously for 4 weeks. Heart was removed and protein and RNA analysis were performed. My data shows that the expression level of HERG protein was restored by BIV pacing more than by RV pacing which lead to the synchronization of the heart beat.

Project Number: SMH033 **Grade:** 11
Title: Disinfecting Weight Equipment
Abstract: The purpose is to discover which product is best for disinfecting weight equipment. I taped a plastic sheet with a square cut out to the weight equipment. The square section was swabbed to test for bacterial contamination both before and after cleaning. After running a matched pairs test, I found that the two most effective products were Lysol and distilled water. I ran a two sample mean test that indicated that both were equally effective.

Project Number: SMH034 **Grade:** 10
Title: Antibacterial Resistance in E. Coli
Abstract: All eleven strains of E. coli will be exposed to the same dose of ampicillin for that same week. The responding variable will be the zone sizes around each ampicillin disk located on the agar plates. To measure the responding variable I record the diameter of the zone size around the ampicillin disk using calipers. The smaller the

zone size around the ampicillin disk the more resistant the bacteria has become to the antibiotic. Meaning the ampicillin disk did not kill the bacterium that was around the antibiotic.

Project Number: SMH035

Grade: 11

Title: Can E.coli Develop a Resistance to Triclosan?

Abstract: This experiment aims to find whether Escherichia Coli can form a resistance to the antimicrobial agent Triclosan. In order to test this, E. Coli was first exposed to a small concentration of Triclosan which was, over time, augmented to double the recommended lethal dose. Measurements were taken through Spectrophotometer readings, average colony counts and zone of inhibition measurements. The results obtained from the experiment suggest that the bacterial growth increased as the concentration of Triclosan increased, despite the concentration being past the lethal dose. Therefore, I concluded that my hypothesis, which stated that the bacteria would gain resistance, was correct.

Project Number: SMH036

Grade: 10

Title: Sanitize or Soap

Abstract: The purpose is to determine if hand washing with soapy water is more effective than with an alcohol-based hand sanitizer. The procedure consisted of placing Glo Germ powder on an object, checking the powdered object under the Glo Box and recording data. Sanitizer was placed on the object and treated areas were observed under the Box and data was recorded. More powder was placed on the object and the powdered object was washed under warm soapy water. The object was placed under the Box and data was recorded. Repeat the procedure on different objects. The hypothesis was supported.

Project Number: SMH037

Grade: 9

Title: What Light Source Slows Growth of Mold Best?

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

Project Number: SMH038

Grade: 12

Title: The Antibiotic Resistance of E. coli

Abstract: Before testing is done agar and broth need to be prepared. Two sets of plates, 25 each, of Luria Broth Agar one set containing a 1% concentration of ampicillin and the other without ampicillin were poured. Two sets of Luria Broth were prepared. Again, one containing ampicillin and the other set without. After these things were prepared, a MM294/pAMP slant culture was inoculated into a tube of Luria Broth containing Ampicillin and one tube without Ampicillin. The Luria Broth was then incubated for 48 hours. After being incubated, a sample was plated on two plates with and two plates without ampicillin using a wire loop and aseptic techniques. The sample of bacteria was re-inoculated into fresh broth with and without ampicillin. Both the plates and broth were incubated for 24 hours and the results were read and observed. This same procedure was repeated for five days. The results were then observed, compared, and statistics will be applied.

Project Number: SMH039

Grade: 11

Title: Duration of Purification Tabs

Abstract: To test the length and efficiency of water purification tablets I conducted a series of three experiments, all checking length and efficiency of the tablets. I treated the water as per instructions and assessed bacterial load every twenty four hours for 120 hours. Next, I inoculated the treated water with E. coli and incubated it at 37°C, finding no bacteria after 192 hours. I repeated this, finding no bacteria present after 240 hours. With this data I concluded that the water purification tablets are very efficient and disinfect water thoroughly and continue to be effective for at least 240 hours.

Project Number: SMH040

Grade: 10

Title: Milk??? I Don't Want It!!

Abstract: Milk is an important component of our diet, but seventy-five percent of the worlds' adult population, including fifteen percent of the United States, can't use it due to lactose intolerance. This science experiment was conducted to find out the levels of lactose in different milks, and to find out the optimum conditions for lactose enzyme activity. This information will give some insights to consumers around the world. From my experimental results, I found that goat milk has the lowest amount of lactose. Also, I found that the optimum conditions for enzyme activity are 35° C, with a pH of seven.

Project Number: SMH041

Grade: 12

Title: Honey...Antiseptic?

Abstract: Honey has historically been used for healing. How effective is honey at inhibiting bacteria? Is there a difference in types of honey? To test the effectiveness of honey, two trials were set up, one with *Bacillus cereus*, the other with *Escherichia coli*. Separate agars were prepared by adding 7% wildflower honey and manuka honey as media for two trials. Control was prepared as straight nutrient agar. The plates were inoculated from 24Hr broth cultures. The plates were incubated for 24hrs and 48hrs. Data shows that approximately half as many bacteria grew on the honey plates as did on the control.

Project Number: SMH042 **Grade:** 12
Title: The Effect of Different Frequencies of Soda Consumption on Oral Bacteria

Abstract: The purpose of this experiment is to determine whether or not the frequency of soda consumption affects the amount of oral bacteria found in the human mouth. To test this, plates containing MM10 sucrose agar will first be made and sterilized. Human subjects will have their mouth swabbed before and after they drink a fixed amount of soda at different time intervals within an hour. A saliva sample will be smeared on the plates, and streptococcus mutans will be grown in an incubator. Data will be collected during this experiment and conclusions will be made using an appropriate statistical analysis.

Project Number: SMH043 **Grade:** 10
Title: Cleaners Inhibiting Bacteria

Abstract: This project benefits society because it shows which cleaner is best for cleaning one's home. To complete this experiment, I made agar plates, micropipetted bacteria onto the plates, and used a spreader to ensure an even coat. I poured each cleaner into separate containers, took the tweezers, grabbed a disk, dipped it into the container of cleaner, and placed it on the plate. I repeated three times, so there were four disks on the plate and repeated for each plate with a new cleaner. I incubated the plates for 24 then 48 hours, measuring the zones of inhibition each time.

Project Number: SMH044 **Grade:** 12
Title: UV Light Sterilization: Running out of Time

Abstract: In a UV light sterilization cabinet for lab goggles, it is suggested to run the cabinet for five to six minutes. I devised an experiment to test the suggested factory settings. I had hypothesized that there would be a steady decrease in bacteria as the time exposure increased and there wouldn't be a significant difference between the five and six minute exposures. I had Petri dishes with nutrient agar and bacteria that I exposed in UV light from one minute to six minutes. I had found that my hypothesis was partially supported. There was a steady decrease in the amount of bacteria but there was also a significant difference between the five and six minute exposures.

Project Number: SMH045 **Grade:** 12
Title: Improving Stethoscope Hygiene

Abstract: 167 randomly numbered stethoscopes from two community hospitals were cultured for bacteria. An educational intervention consisting of posters, PowerPoint presentations, periodic mass staff e-mails, and other hardcopy reminders was presented at both sites. The stethoscopes were recultured after the intervention during the first month, (week one and week three), second month, third month, and fourth month post-intervention. Colony counts were significantly reduced in all post-intervention months compared to pre-intervention, ($p < .05$, Bonferri Pairwise analysis). MRSA stethoscope colonization was drastically reduced over the course of the study. Additionally, clinician handwashing compliance was improved and nosocomial infection rates declined.

Project Number: SMH046 **Grade:** 9
Title: Colloidal Silver Antibacterial Assessment
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH047 **Grade:** 11
Title: A Sticky/Licky Situation

Abstract: The purpose of my experiment was to find out whether or not a dogs' mouth is cleaner than a humans' mouth and to see if dog saliva can kill bacteria effectively.

Project Number: SMH048 **Grade:** 12
Title: Prolonging Chicken Quality

Abstract: Purpose is to determine how long to store raw chicken and retain its quality. Refrigerate ten raw chicken tenders. One day after sell-by, extract tender. Immerse in 400 mL sterile saline water (0.45%). Dilute sample. Place 1 mL on Petri dish. Distribute agar over sample. Repeat procedure for remaining nine tenders. Incubate at 7° C for 10 days. Record colony counts. (After first test, refrigerate five tenders at -4° C and five at 7° C.) Repeat

procedure every other day. Perform statistics and regression analysis. After seven days, -4° C chicken loses quality; only three days for 7° C chicken.

Project Number: SMH049

Grade: 12

Title: Turf/Grass/Bacteria?

Abstract: The potential presence of methicillin-resistant strains of *Staphylococcus aureus* on synthetic turf fields has sparked controversy. These methicillin-resistant (MRSA) strains can cause infections that are very hard to eliminate, and can be life threatening. Recently these infections have become more prominent among in athletic situations. Because of safety restraints, *Staphylococcus epidermidis* was the model bacteria used in my experiment. This experiment was designed to determine whether the crumb rubber synthetic turf base supports bacteria better than natural soil. The data collected indicated that natural soil supported the *S. epidermidis* more effectively than the crumb rubber base.

Project Number: SMH050

Grade: 11

Title: Exostosis of the Ear

Abstract: The purpose of this project was to determine if the direction of head deflection affects the severity of exostosis present in the ears. Kayakers were obtained and their ears were examined for exostosis using an otoscope. The subject was asked which side he/she turns his/her head towards while paddling. The results showed the ear opposite the direction the head is turned towards had a greater severity of exostosis. 81 percent had the more severe case of exostosis present in the ear opposite the direction he/she turns his/her head towards.

Project Number: SMH051

Grade: 12

Title: Advil's Influence on Prokaryotic Gene Expression

Abstract: The purpose for performing this experiment was to investigate if the common pharmaceutical Advil causes any genetic alteration. This project is a continuation of my 2009 project, "Do Pharmaceuticals interfere with Gene Expression?" This year I used a plasmid called pGEM 7, which contains a functional sequence for resistance to ampicillin and the LAC Z gene, an intact sequence for alpha-complementation. I exposed the plasmid to various amounts of Advil and then transformed the plasmid with *E. coli* cells. I then plated these transformed cells and utilized a technique called blue/white screening. After performing this experiment, I concluded that there was a disruption in gene transformation at all concentrations of Advil that were used.

Project Number: SMH052

Grade: 11

Title: Does Listerine Conc. Matter?

Abstract: This experiment was designed to determine if the concentration of Listerine® really matters. Johnson & Johnson, the company that produces Listerine®, says to use it at full strength at all times. To test this, three different solutions of water and Listerine® were prepared and tested on *Staphylococcus epidermidis*. The results from the experiment indicated that the 25% and the 50% concentrations of Listerine® killed the bacteria just as well as the concentrations with 100 % Listerine.

Project Number: SMH053

Grade: 12

Title: Effectiveness of Zoonotic Disease Prevention in Petting Zoos

Abstract: There is considerable concern about H1N1 and other diseases that have animals as an intermediate host as well as zoonotic diseases. Public health agencies currently recommend hand washing alone as adequate protection in petting zoos. The purpose of this experiment is to determine if this is an adequate measure. The procedure is to swab the children several times before and after handling normal petting zoo animals and allowing them to handle the animals and wash their hands as they normally would. They were swabbed several hours after handling the animals to test for recontamination from their clothes.

Project Number: SMH054

Grade: 11

Title: Extracted Antibiotics

Abstract: After *Bacillus subtilis* was discovered in 1941, "the wonder drug" was being sold worldwide as a medicinal product that can treat intestinal problems. My experiment was conducted to determine whether the antibiotics found in *Bacillus subtilis* can kill other gram positive bacteria without the antibiotics being extracted. I predict that after applying the bacillus to the *Staphylococcus epidermidis* (gram positive bacteria), the growth of the *Staphylococcus epidermidis* will be inhibited. After conducting the experiment and changing the variable, the result was the same. It doesn't matter if it is stored in a refrigerator or an incubator, the growth of the *Staphylococcus epidermidis* was not inhibited by the *Bacillus subtilis*. The antibiotics found in *Bacillus subtilis* can not treat other bacteria without being extracted.

Project Number: SMH055 **Grade:** 9
Title: Krazy Kimchi
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH056 **Grade:** 11
Title: A Study of Omega-3 Fatty Acids on Cancer
Abstract: The purpose of my experiment was to evaluate the effect and mechanism of Omega-3 fatty acids (Omega-3 PUFAS) on liver cancer. Cultured liver cancer cells were treated with two Omega-3 PUFAS, DHA and EPA. The results were then compared to those of arachidonic acid, an Omega-6 PUFA. The number of viable cells was determined with the WST-1 cell proliferation reagent. The cells were subjected to gel electrophoresis and immunoblotting to determine the protein levels of COX-2 and Beta-catenin. The data was statistically analyzed and Omega-3 PUFAS were found to inhibit COX-2 and Beta-catenin pathways as well as tumor cell growth.

Project Number: SMH057 **Grade:** 11
Title: Is There Goo in the Moo?
Abstract: Please visit student's exhibit for the abstract.

Project Number: SMH058 **Grade:** 9
Title: Do Diff. Sweeteners Inhibit Prolif. of *S. mutan*?
Abstract: The purpose of this experiment was to determine which sweetener inhibits the proliferation of *Streptococcus mutan* the best. I used a spectrophotometer, a pH meter, and performed a colony count to test this. Spectrophotometric tests were conducted before and immediately after inoculation, at 24, 48, and 72hrs. Colonies were cultured from a 10^{-9} serial dilution after 72hrs to obtain a colony count. Results obtained from my experiment did support my hypothesis which was that the sterile sweeteners tested would inhibit the proliferation of *S. mutan* in the following order: saline (control) (most), Splenda, Dominos, Sun Crystals, and Raw sugar (least).

Project Number: SMH059 **Grade:** 9
Title: The Relationship Between Dynamic and Static Foot Geometry
Abstract: The purpose of this study was to determine if the static and dynamic measurements of the feet can be used interchangeably as a tool to evaluate foot structure. Five volunteers (10 limbs) were involved in this project. The Emed system was used to collect the static and dynamic data. Out of the 13 parameters analyzed, the subarch angle, coefficient of spreading, and foot length showed statistical differences between the static and dynamic measurements. These results may be of clinical relevance in the assessment of orthosis for patients with gait disorders and in footwear selection for performance evaluation in runners.
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Project Number: SMH060 **Grade:** 9
Title: Is eating a sugary breakfast better than skipping breakfast?
Abstract: My Hypothesis: I think eating a sugar breakfast is more helpful than skipping it.
Procedure: I am going to have groups of even people eating a sugar breakfast and the other half skip it. I will ask them in about 30 minutes to see how they are feeling, then ask them two hours later to see if they feel tired or energetic or anything else. I will mark them down in a chart, which ever group felt not tired, lazy, weak, or down, then that would be the winner.

Senior Physics

Project Number: SPH001 **Grade:** 9
Title: Efficient Rocket Nose Shape
Abstract: I have designed a control experiment in which size, length, and weight are all kept constant. The difference in the aero dynamic nose-shape, that is the blunt cone, cone, hemisphere, and parabola are kept as the variable. The efficiency of the rockets can be determined by the altitude they reach. Each model rocket will be launched several times. Angle tangent will be measured with an instrument. This will be used to calculate the altitude reached by the rockets in each trial. The design with the parabola nose has lowest drag and will reach the highest altitude.

Project Number: SPH002 **Grade:** 10
Title: Projectile's Mass on Flight
Abstract: Testing effect of a projectile's mass on its accuracy, precision, and penetration. Mass will be varied by utilizing different size BBs. Distance will be varied to check to consistent results. A shooting vice will be used to keep the position of the gun constant. Penetration will be measured by using multiple layer of Stryfoam.

Project Number: SPH003 **Grade:** 10
Title: Which brand of dishwashing detergent works best?
Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH004 **Grade:** 9
Title: Holding Power of Nails
Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH005 **Grade:** 11
Title: Does color have an effect on memory?
Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH006 **Grade:** 12
Title: MP3: Squeeze
Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH007 **Grade:** 11
Title: Crystal Sound
Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH008 **Grade:** 10
Title: Hydro-dynamics of submarines
Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH009 **Grade:** 12
Title: Lighting With LEDs
Abstract: LEDs (light emitting diodes) are becoming more and more popular in todays society. LEDs are being utilized for almost anything that requires a light source and they are slowly replacing incandescent light bulbs altogether. LEDs can be found in almost anything televisions, remote controls, flashlights, traffic signals, vehicles, police cars, optical mice, and many more products. Experimentation was conducted with a light meter in a dark room to determine which color of readily available light emitting diodes provides the most light. Experimentation concluded that blue LEDs provide the most light and amber and red LEDs provide the least light.

Project Number: SPH010 **Grade:** 11
Title: The Effect of Mass on the Precision of Projectile Pathways
Abstract: The Effect of Mass on the Precision of Projectile Pathways

The hypothesis is that a .28 gram bb will be the most precise at fifteen yards, this is because it is the heaviest bb, and the heavier the bb the harder it is to affect the bb's flight pattern. The procedure includes first setting up the gun in the vice. Then set up the targets down range. Next load the first round of ammunition. Last change ammunition after every twenty shots. After performing the tests, the data collected supported the hypothesis. The next most precise was the .20 bbs, then the .23 bbs, and last the .12 bbs.

Project Number: SPH011 **Grade:** 9
Title: Airgun Ballistics--Penetration
Abstract: The purpose of this experiment was to determine whether or not the shape of a bullet has an effect of the depth of penetration of that bullet in a ballistic gel sample when fired from an airgun.

Project Number: SPH012

Grade: 10

Title: Does the flex of a golf club's shaft affect the ball's distance?

Abstract: The purpose of this experiment was to determine whether or not the amount of flex in the shaft of a golf club has an effect on the distance a golf ball travels.

Project Number: SPH013

Grade: 9

Title: Gliders

Abstract: In today's world, some of the main concerns are the environment and green energy. In this experiment, I investigated the practicality of stabilizers on gliders. Do they help the gliders fly or just add weight? If gliders could be improved and more widely used for shipping, transportation, and in war, we could reduce air pollution. For this experiment, I created three models and tested them with and without a stabilizer. My results were that all three models flew better with a stabilizer. In conclusion, stabilizers are very practical to air travel especially engineless air travel.

Project Number: SPH014

Grade: 9

Title: Seebeck Effect Energy Recycle

Abstract: This project was to test and confirm Seebeck's effect on thermoelectricity. The goal of this experiment was to confirm that when two completely dissimilar metals are connected and placed in one solution in two containers, which are at different temperatures, will create voltage. I got several different thermocouple wires and created 4 different types thermocouples. I used 100°C, 90°C, 80°C, and 70°C as my high temperatures. My reference temperature was 0°C. I later learned that N.A.S.A. used Seebeck's effect in radioisotope thermoelectric generators in many shuttles, which lead me to create a model of my own radioisotope thermoelectric generator.

Project Number: SPH015

Grade: 11

Title: Solar Furnace

Abstract: I constructed a solar furnace using mirrors, plywood, screws, and silicone. Using my solar furnace, I used it to heat up 200ml of water at different times of the day: 9:00AM, 12:00PM, and 3:00PM. I found that the solar furnace was used best when the sun was highest in the sky, at 12:00 noon. Solar furnaces are very useful as a cheap, easy way to take advantage of the sun's energy. They are used as solar cookers, as a source of energy for household utilities, and as a way to turn iron ore to steel, along with many other applications.

Project Number: SPH016

Grade: 11

Title: Lip and Tongue Force

Abstract: The purpose of this experiment was to find out how much force the lip and tongue exert against the teeth when swallowing and whether or not having an open bite could affect this amount of force. To test this, fiber optic wire with a laser going through it was placed in front and behind people's teeth. They were then asked to swallow five times and a power meter was used to measure the amount of force exerted. On average, people with an open bite exerted significantly more force against their teeth than people with a normal bite.

Project Number: SPH017

Grade: 11

Title: Oh, the Humidity!

Abstract: Many things interfere with radio wave transmission, but what effect does humidity have on radio? This project focuses on determining whether humidity effects on radio wave propagation. Three devices (microwave transmitter, wireless router, and an FM transmitter) were placed in a humidity controlled environment. Their transmission was tested at different humidity. The hypothesis was that humidity would hinder radio waves. The experimental results supported the hypothesis by showing that all three devices had lower transmission strength in higher humidity. The experiment showed that though all the devices transmitted at different strengths, all had lower transmission strength in high humidity.

Project Number: SPH018

Grade: 11

Title: The Glow from the Flow

Abstract: My purpose was to make different turbines and see which one produces the most electricity.

Project Number: SPH019

Grade: 9

Title: Effects of Roof Color and Reflectivity on Energy Efficiency

Abstract: In American homes, 45% energy is spent on HVAC systems. This energy could be reduced by changing the roof color and reflectivity. I tested the effects of black, white, mirror, and aluminum roofs on internal temperatures of four model homes by placing them under sunlight, periodically recording internal and external temperatures. My results showed: with a black roof, internal temperature was 1-7°C higher than ambient and with white, mirror, and

aluminum roofs internal temperatures were close to ambient. I concluded that black roofs are useful in winter to absorb solar-heat, and white/aluminum roofs are useful in summer to reflect solar-heat.

Project Number: SPH020

Grade: 10

Title: How is a Battery Affected by its Charging Plan?

Abstract: This study is designed evaluate how to get the most life out of batteries. A circuit was constructed so that the batteries could be monitored and controlled through repeated charge and discharge cycles. It was hypothesized that charging a battery only when it is run all of the way down would be better for battery life than topping it off frequently. It was concluded that any usage within the specifications for the battery proved to not damage the battery. However, if the battery is used outside of the specifications then it will die after a certain number of cycles.

Project Number: SPH021

Grade: 10

Title: All Soaked Up

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

Project Number: SPH022

Grade: 10

Title: What's the Best Relay Start Position?

Abstract: A question that bothers most swimmers during a relay is, whether or not a specific relay position is faster or better than another. The purpose of this experiment was to test which starting position was the best. I tested several swimmers and have them start in different positions. With the different start positions, I had them swim to specifically marked spots in the pool. While they swam I kept track of the time it took to reach the marked measurement. After each start had been tested and times compared, I learned that all the starts are about the same.

Project Number: SPH023

Grade: 9

Title: The Golden Scale

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

Project Number: SPH024

Grade: 9

Title: Propeller Perfection

Abstract: For my project I wanted to find which propeller would make my remote cotrolled airplane fly the fastest. I tested ten differnt angled and sized propellers. I flew the aircraft around two cones that were seperated 6 meters apart and tested each propeller three times for a total of thirty flights. I then compared the results to find the answer to my question.

Project Number: SPH025

Grade: 9

Title: The Science of the Sweet Spot

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

Project Number: SPH026

Grade: 11

Title: What Makes It Flow?

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: SPH027

Grade: 10

Title: The Effects of Spin on the Flight of a Recreational Ping Pong Ball

Abstract: The purpose of this experiment was to determine how backspin affects the distance a ping pong ball travels. The ball was dropped from a constant height onto a drill bit covered in sand paper spinning at a predetermind speed. It would then traverse some distance that being the dependent variable. The acerage distance was taken for the five different spins respectively. An equation was made using curve fitting to find the relationship. This could obviously be used at different conditions such as another altitude or temperature. One could additionally do this with different objects.

Project Number: SPH028

Grade: 9

Title: Wire-Fire (Wi-Fi) Gun

Abstract: The purpose of this project is to eliminate the sound that a real gun makes and to cut the cost by developing an electromagnetic gun, called the Wire Fire gun. I believe that this gun will be able to shoot a bullet 300 ft/sec or more without the animal knowing that it was fired upon. For the bullet, I believe that a cylindrical one inch piece of hollow steel will work better than a solid piece of steel the same size.

Project Number: SPH029 **Grade:** 9
Title: Fastest Way to Cool a Soda?
Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH030 **Grade:** 9
Title: Controlling Chaos
Abstract: Build a Lorenzian water wheel. Increase water flow into buckets on wheel until rotation becomes chaotic. Determine water level needed to create chaos.

Project Number: SPH031 **Grade:** 12
Title: Physical Mechanism of Parity Violation
Abstract: The Physical Mechanism of Parity Violation in Beta Decay in Observance of the Weinberg-Salam Model of Electroweak Interactions:
Parity violation in beta decay results in the anisotropy of the resulting electrons' direction emission. Our theoretical investigations assert that the cause of this asymmetry arises from the interaction of the emitted electron with the zero-point energy (ZPE) field. As a result of the asymmetry in isotopic spin of the nuclei, the e-/e+ pairs of the ZPE field assume a favored orientation, resulting in the preferred direction emission of the decay electrons. Hence, the interference of the electromagnetic and weak currents of beta decay results in the parity violation precipitated by product leptons.

Project Number: SPH032 **Grade:** 9
Title: Leaning Tower of Pasta
Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH033 **Grade:** 11
Title: Water Temperature
Abstract: Please visit student's exhibit for the abstract.

Project Number: SPH034 **Grade:** 12
Title: Camber Design v. Lift of Airfoils
Abstract: The purpose of this investigation, Camber Design v. Lift of Airfoils, is to determine which camber design will generate the most lift. Six airfoils were constructed out of bass wood and a wind tunnel was made to test for lift. A one speed motor was used for the air flow. Overall, it was the early airfoil camber design that generated the most lift because it had the third largest top to bottom curve ratio, and because the bottom curve was the most carved out, allowing an additional applied force to contribute to the lift.

Project Number: SPH035 **Grade:** 10
Title: How Strong is Your Hair?
Abstract: Purpose: To determine if shampoos claiming to "improve hair strength" actually fulfill their intent. During my experiment I used: 2 non-dyed, partially damaged hair samples, Dove Intense Damage Therapy Shampoo, 14 Pre-sterilized Petri dishes, a lab notebook/writing utensil, calculator, camera, Isopropyl alcohol, weights 5mg--50mg, White Rain Fortifying Shampoo, and a Measuring device. The brand that strengthened hair best overall was Dove Intense Therapy Shampoo. My hypothesis was upheld by my experimental results.

Project Number: SPH036 **Grade:** 9
Title: The Range of Projectiles
Abstract: The purpose of the experiment was to determine which angle of launch would give the projectile the furthest range. I used a catapult to launch a steel ball 10 times at every angle I wished to test, which included 10, 20, 30, 40, 45, 50, 60, 70, 80, and 85 degrees. I placed carbon paper and xerox paper beneath the steel ball in order to mark where it landed. My data showed that at 45 degrees, the projectile had the greatest range.

Project Number: SPH037

Grade: 9

Title: Dimples and Drag

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

Project Number: SPH038

Grade: 10

Title: The most accurate .22 caliber bullet type

Abstract: The purpose of this experiment was to determine which type of .22 long rifle bullet was the most accurate at hitting a target. The different types of bullets that were used were fire copper hollow point, supersonic hollow point, brass plated hollow point, lead hollow point, and hyper velocity hollow point.

Project Number: SPH039

Grade: 9

Title: Now approaching the Tee Box

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