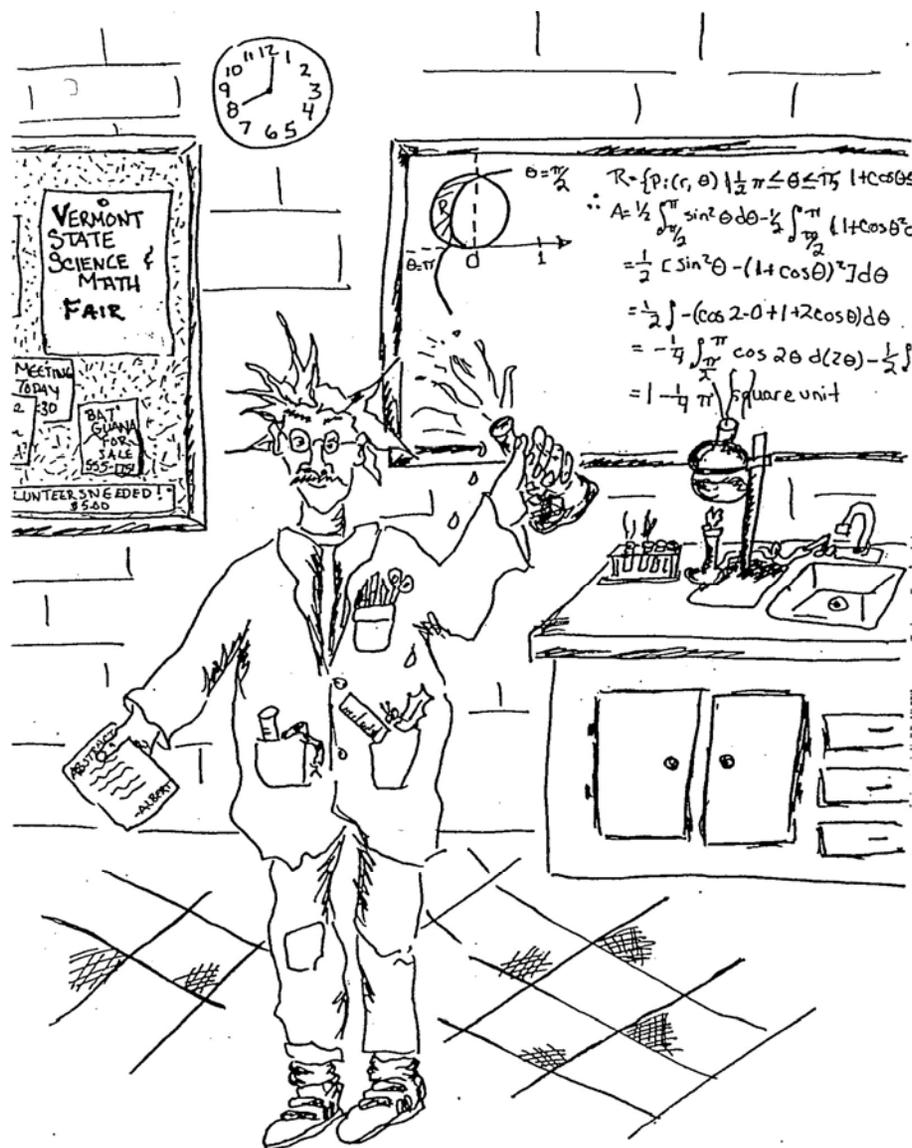


# 47<sup>th</sup> ANNUAL VERMONT STATE SCIENCE & MATHEMATICS FAIR

NORWICH, UNIVERSITY  
NORTHFIELD, VERMONT

## March 28, 2009



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**Vermont State Nurses' Association**

# PROJECTS

<u>PROJECT AREA</u>		<u>PROJECT NUMBER</u>	<u>LOCATION</u>
BIOLOGY:	botany, physiology & zoology	B 01 - B 44 B 45 - B 85	Room 243 Room 267
CHEMISTRY:	general & consumer chemistry	C 01 - C 27	Room 239
GEOLOGY:	geology & env.chem.	G 01 - G 12	Room 160
GROUP PROJECTS:		GP 01 - GP 20	Room 253
MATHEMATICS:	math and computer science	M 01 - M03	Room 145
PHYSICS:		P 01 - P30 P 31 - P43	Room 151 Room 145
SOCIAL SCIENCE:	psychology and sociology	S 01 - S 21	Room 165

**(Abstracts are arranged in this booklet alphabetically by students' last names; group projects are alphabetized by the name of the student who comes first on the abstract.)**

## **SCHEDULE OF EVENTS**

<b><u>TIME</u></b>	<b><u>EVENT</u></b>	<b><u>LOCATION</u></b>
7:45 am - 9:00 am	Students Set Up Projects	Science Complex
8:00 am - 9:00 am	Judges' Meeting	Cabot 295
9:00 am - 12:30 pm	Judging of Projects - Projects Open to Public	Science Complex
12:30 pm - 1:15 pm	Luncheon	Wise Campus Center
1:15 pm - 1:30 pm	Students take down projects	Science Complex
1:30 pm - 3:00 pm	Awards Ceremony	Dole Auditorium in Webb Hall

**Projects must remain in place at least until 12:30 pm to be eligible for monetary awards.**

### **Judges Lounges**

Science Building	146
Science Building	155
Science Building	251
Partridge Hall	228
Thompkins Hall	275

**Judges Lounges are for Judges only.**

<b>NAME(s)</b>	<b>Chris Adams</b>	<b>PROJECT NUMBER</b>	<b>S01</b>
<b>SCHOOL</b>	<b>Hinesburg Community School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Stephanie Konowitz</b>		
<b>PROJECT TITLE</b>	<b>Gender and the Brain</b>		

**ABSTRACT**

The brain works in specific but complex ways, there are four different lobes, the parietal lobe, the frontal lobe, the temporal lobe, and the occipital lobe. My experiment was designed to find which gender has better logic comprehension. I put the test subjects in a room and gave them three different tests. The first was a geometry dealing with shapes, and spacious thinking, a brain teaser test to see who could go through these the fastest and finally a logic test that included that included various brain teasers and individual thinking. I then timed each person for each test to see there speed and score. I then graded them on speed and percent correct. I wanted to do this experiment because I hear on the Discovery Channel and magazines that talk, say that girls have faster developed than boys. Apparently scientists say that girls have brain cells that start aging age younger age, meaning that they understand younger. I wanted to test that for myself. The girls were faster, and a lot more focused than any of the boys. I think that the reason the boys were so much slower is because they were not focused on anything. As if it were even possible, the 8th grade boys were even less focused

<b>NAME(s)</b>	<b>Andrew Akiki</b>	<b>PROJECT NUMBER</b>	<b>P01</b>
<b>SCHOOL</b>	<b>Mater Christi</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Michelle Donlon</b>		
<b>PROJECT TITLE</b>	<b>Star Light, Star Bright...or is it?</b>		

**ABSTRACT**

Light pollution is a major issue around the world which prevents astronomers and stargazers from seeing the night skies. Unnecessary and poorly designed lighting also wastes energy and money. This experiment provides a simple way for people to analyze and understand the extent of the problem in their local area using a digital camera and free image analysis software.

The stated hypothesis and expected result was ôif skyglow is measured in a developed area, then there will be more light pollution compared to a rural area.ö The data obtained matched the predicted behavior. This agreed with the concept that when there is less light from the ground being reflected into the sky, there is less skyglow. Conversely, the more light sources reflecting into the sky, the more light pollution there is.

The digital image data collected ranged from 0 to 255 with 0 being complete darkness and 255 full brightness. The data was divided into four groupings: rural, suburban (dark), suburban (light), and urban. The data from the rural images ranged from 2.6 to approximately 10. The suburban (dark) images ranged from 20.4 to 31.4. The suburban (light) images ranged from 39.4 to 63.1. Finally, the urban data point collected was about 99.

This procedure was validated as an inexpensive way to collect light pollution data using readily obtained materials. The data collected showed the impact of lighting density on the amount of light pollution observed.

<b>NAME(s)</b>	<b>Sara Alexander</b>	<b>PROJECT NUMBER</b>	<b>B01</b>
<b>SCHOOL</b>	<b>Rutland High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Ann Marie Mahar</b>		
<b>PROJECT TITLE</b>	<b>The Effect of Fluid on the Kidneys</b>		

**ABSTRACT**

The human kidneys are one of the most vital organs in the human body. Not only do they filter out the good from the bad blood, but they also filter out the good from the bad liquids. With this experiment I wanted to find out which of my three liquids, (pepsi, water, or Gatorade), would cause a person to urinate that fastest and if the pH had any affect on it.

○To do this experiment I made a total of 12 people, (4 for each liquid), drink 24 oz. of a liquid in a half an hour. I took the pH of the liquid I was testing, as well as the color and temperature of the liquid. I recorded the time that they started drinking the liquid and added a half an hour to that time in which they must stop drinking. Once they drank their liquid, they had an hour in which to urinate it out. I recorded the actual time they stopped drinking and added an hour in which they had to stop drinking. Once they told me they had to go to the bathroom, I handed them a moist cleaning wipe in order to get a clean test. I told them they needed to wipe once and then they could urinate in the cups I provided them with. I then repeated this for the other liquids as well as the remaining people. After I had a collection of urine I used tweezers to take a pH sample and recorded it. I also wrote down the color of the urine and the amount of cloudiness.

○My conclusions to this experiment were that the Gatorade made people urinate the fastest, and also has the lowest pH. Normal pH of urine is a 6 and I had ranges from 5.5 to 7.5, which is great. The pepsi took the longest to urinate and had the most concentrated urine. Water was in the middle for both tests.

○I would recommend if youÆre in a meeting or in a sports game that you do not drink Gatorade because it will make you urinate the fastest. I also wouldnÆt suggest something like an energy drink because they wonÆt hydrate you fast enough. Also, having that much caffeine in your body isnÆt good for you anyway. So I would recommend plain water for such occasions. It will still make you go to the bathroom, but not as fast as other liquids.

<b>NAME(s)</b>	<b>Aya Alnamee</b>	<b>PROJECT NUMBER</b>	<b>B02</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>Water Quality and Stream Project in Different Places in Vermont</b>		

**ABSTRACT**

In 1919 Theodor Escherich discovered the bacterium Escherichia coli. Subsequent studies showed a link between human disease and a high level of E.coli in the water. As a result of the science revolution we can measures the E.coli level in the water in different places. For my project I took samples of water from different brooks and streams in Vermont: Potash Brook (I followed this one in different areas, upstream from UVM farms and downstream from UVM farms and at Dorset Street)and Muddy Brook. I tested the E. coli level in the water samples and I compared the results to see which sample had more E. coli than the other. My hypothesis was that the level of the E. coli near the run off areas like paved roads would be higher. Also the level of E.coli will be lower far away from these places; for example near trees. I took samples from the same places more than once in different weather to see if weather affects the data. Each of those areas had different circumstances which made the E.coli level differ. For example Potash brook has significantly more E.coli than Muddy Brook and the sites have decreasing amounts of E.coli in this order (that is the first in the list has the least E.coli) Dorset Street, upstream from the UVM farm, and downstream from the UVM farm.when I analyzed my data I realized that stormy weather, the surrounding area and runoff can affect the water and raise itÆs E. coli level. The Muddy Brook area contained 25 percent less E. coli less than the Potash Brook area.

<b>NAME(s)</b>	<b>Eily Anderson</b>	<b>PROJECT NUMBER</b>	<b>C01</b>
<b>SCHOOL</b>	<b>Christ the King School in Rutland, Vt</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Mrs. Wright</b>		
<b>PROJECT TITLE</b>	<b>What's the Fastest Way To Cool Soda?</b>		

### ABSTRACT

My question was whats the fastest way to cool a can of soda? I bought twelve cans of soda and I used four containers. The four containers I had were my refrigerator, my freezer, i filled a container with ice water, and then my last container had just ice in it. I measured the temperature of each can of soda that was at room temperature and I then put three cans of soda in each container. In five to ten minute intervals, i measured the temperature of the cans of soda. After about an hour and a half, I had figured out that the ice water bath was the one that cooled the cans of soda the fastest. In the end the temperature of the can of soda in the ice water bath was 34 degrees, the temperature of the cans of soda in the refrigerator was 35 degrees, the temperature of the freezer was 35 degrees, and the ice was 44degrees.

<b>NAME(s)</b>	<b>Patrick Asselin</b>	<b>PROJECT NUMBER</b>	<b>P02</b>
<b>SCHOOL</b>	<b>Homeschool</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Jean C. Asselin</b>		
<b>PROJECT TITLE</b>	<b>Insulation</b>		

### ABSTRACT

**Purpose:** To find out which insulation provides the best resistance to heat flow.

**Hypothesis:** I think the sawdust will perform the best at keeping out warm air and the extruded foam board will function best at retaining warm air.

**Procedures:** I used fiberglass, extruded foam board, sawdust, packing peanuts, plastic bags, and the control (nothing) for insulators. I took one of the six insulators and placed it in the three quarter inch space between an inner box and an outer box. For the first part of my experiment, I took a twelve and three quarter inch by fifteen inch piece of wood with a six inch wide hole in the center and placed a lamp through it. I put a remote thermometer in the inner box and placed the wood and lamp on top of the boxes. I turned on the lamp and waited until the thermometer reached one hundred degrees Fahrenheit. I then turned off the lamp and recorded the temperature every fifteen minutes from that point for forty-five minutes. For the second part of the experiment, I froze nine hundred ten milliliters of water in a suitable plastic container. I placed a remote thermometer inside the inner box and placed the container of ice in the box and took another twelve and three quarter inch by fifteen inch piece of wood on top of the boxes. From there, I recorded the temperature every fifteen minutes from that point for forty-five minutes.

**Results:** My results disproved my hypothesis. Sawdust retains heat best and packing peanuts keep out the heat best. I think it resulted this way because the sawdust is denser; the packing peanuts did better than the other materials possibly because it is airy, and tightly packed.

<b>NAME(s)</b>	<b>Harshal Athalye</b>	<b>PROJECT NUMBER</b>	<b>B03</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Mr.Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>A Breath of Life Experiment Dealing With Lung Capacity</b>		

**ABSTRACT**

Every athlete around the world has one goal in common whether they consciously try to achieve it or not. They all focus on lung capacity in order to enhance their performance. "Good" lung capacity is a general term used to describe an individual's breathing in relation to many factors specific to that person, such as weight, sex, age, and activity. Lung capacity is used to help people see what can affect their in a positive or negative way. For my study I try to use two main methods; blowing up a balloon, and using a homemade spirometer. My control group will be average citizens that are moderately active and live an average lifestyle. My experimental groups will include; smokers, people of different height, male, female, and various activity levels. My original hypothesis is that taller people, non-smokers, males, and most active people will have the greater lung capacity. My homemade spirometer consists of a tube, a soda bottle, a large container, tape, a graduated cylinder and markers. First I will place tape on the bottle vertically. Second I'll fill the graduated cylinder to 60mL of water and pour it into the bottle. Using a marker I will mark the 60mL increment. Then I will fill the container full with water, next tilt the bottle upside down placing the head in the container filled with water. One end of the tube is attached to the mouth of the bottle (this has to be done underwater), and the other end of the tube is used for blowing. After the person blows air will replace the water in the bottle. To find lung capacity you multiply the number of lines times 60 because of the 60mls water increments. So far my results are fully in sync with my hypothesis. Smokers have the least amount of lung capacity, while athletes the most.

<b>NAME(s)</b>	<b>Danielle Ayer, Madison Dunn</b>	<b>PROJECT NUMBER</b>	<b>GP01</b>
<b>SCHOOL</b>	<b>Main Street Middle School</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Eli Rosenberg</b>		
<b>PROJECT TITLE</b>	<b>Are Your Pearly Whites A Fright or Are They Bright?</b>		

**ABSTRACT**

We wanted to do this project because we both have braces and can't wait to get them off! When we have new straight teeth, we would also like to have white teeth. We thought that if we do this experiment it would help us decide which product will give us the best results. We believe that Colgate Visibly White will work the best. We think this because we talked to the tooth specialists and they said that Colgate Visibly White works the best. In this experiment we will use eggs to simulate teeth. We will be staining our eggs with chromogenic agents; food (beverages mostly) that often causes teeth staining. To whiten these eggs we will follow the steps that the whitening products give us. Each day we will record our results as well as take pictures. After conducting our experiment we observed that Colgate Visibly White worked the best throughout all of the different stains. I also observed that Listerine Whitening Pen did the worst throughout all the different stains. After completing our experiment and analyzing our data we accept our hypothesis. Colgate worked significantly better than any of the other whitening products.

NAME(s) Elizabeth Backus PROJECT NUMBER S02

SCHOOL South Burlington High School GRADE 10

TEACHER Curtis Belton

PROJECT TITLE The Effects of Lack of sleep on Mood and Performance in Teenagers

### ABSTRACT

They study of how the amount of sleep effects the activity and thought process of Teenagers, being the most vulnerable in this area, have been studied many times over to see what is the best time, amount, and circumstances for sleep in the adolescent stage. It has been written that more sleep does help the average kid but too much sleep could be a side affect of depression. The purpose of this study is to see if the change in sleep patterns during vacation, regular school weeks, and a week after rest can affect the clarity of thought, mood and physical ability for students throughout their day. My hypothesis is that performance and mood will decrease when there is less than adequate sleep. Twenty students agreed to volunteer for this study. The study design is a prospective cohort with cross of controls using each subject to compare weeks druing school where they are likely to have less sleep with vacation weeks when they are likely to have more. Students are filling out questionnaires each night about their amount of sleep, quality of sleep, and how they performed that day; they also partake in a memory game that is linked to the email online. Once a week they are going to complete a mood questionnaire as well. I expect that the data can be complied and analyzed with a statistical analysis to show if there is a singificant drop in the mood and performance when there is lack of sleep.

NAME(s) Sean Ballard PROJECT NUMBER G01

SCHOOL Christ the King School GRADE 8

TEACHER Mrs. Wright

PROJECT TITLE What Counter Top Surface Stains more?

### ABSTRACT

I tested what countertop surface is stained more by oil. I had four samples of different stones that I attempted to stain. I used masking tape to separate the stone into 4 quadrants. First I poured 1/4 of a teaspoon onto each stone. I let them sit for about 30 minutes and then wiped it away with a paper towel. The granite showed no signs of stain but the surface was slick and greasy. The pre-sealed granite was not affected in anyway, no stain, no grease. The quartz was not stained either but it became very greasy, almost oily. The soapstone though absorbed almost all of the oil, had a massive stain taking up at least 3/4 of each quadrant and was almost completely dry after. i have concluded that the only surface of the 4 that stained was soapstone.

NAME(s) Alecia Bassett PROJECT NUMBER B04  
SCHOOL Northfield High School GRADE 11  
TEACHER Cynthia Tomczyk

PROJECT TITLE The Effect of Different Concentrations of  
Ibuprofen on the Growth of Great Northern  
Bean P

### ABSTRACT

The data for this lab was obtained by conducting five trials, with five tests each, three separate times, on how different concentrations of ibuprofen in a distilled water and isopropyl alcohol solution, affect the growth of bean plants. Ibuprofen concentrations were made so that 2.0, 1.5, 1.0, and 0.5 grams of ibuprofen was dissolved by isopropyl alcohol and then mixed with 10 ml of distilled water to create 20, 15, 10, and 5 percent ibuprofen solutions; distilled water with no ibuprofen present was used as a 0 percent solution. The beans, separated into groups of five, one for each concentration, were then watered with the separate solutions every other day for three weeks. The first set of results that was presented contained no information; all bean plants perished. The lab was then modified by reducing the amount of ibuprofen found in each solution by half. The next results yielded data as follows: the plants watered with the 10, 7.5, 5, 2.5, and 0 percent solutions had average percent changes in height that are, respectively, 76.2, 177.4, 147.9, 338.4, 494.9 percent. The lab was then altered so that each amount of ibuprofen was dissolved in 5 ml of isopropyl alcohol; 5 ml was also added to the 0 percent solution. In the third set of results, the average percent change in the height of the bean plants when watered with 10, 7.5, 5, 2.5, and 0 percent solutions were 83.33, 95.24, 121.7, 65.22, and 129.2 percent. The data collected in the second and third set of results, shows a general trend which dictates that the higher the concentration of ibuprofen the bean plants were watered with, the lower the average percent change in height of the plants was.

NAME(s) Nathaniel Bauman PROJECT NUMBER C02  
SCHOOL Mount St. Joseph Academy GRADE 8  
TEACHER Timothy McCue

PROJECT TITLE MSG

### ABSTRACT

MSG or monosodium glutamate has been used as a flavor enhancer for decades. I have decided to test if MSG really does enhance the flavor of food with an experiment. Within it test subjects are given a chance to decide if they prefer food that is natural, or food that contains MSG.

To test this experiment I first found a savory or salty food many people enjoy, such as mac and cheese, which I used, or others like shepards pie, soup, or other foods. I made one batch of mac and cheese and split it in half and added MSG to one part of the batch and tested it on five people twice and they preferred the one with MSG both times. I will redo this test though with ten people who don't know what food has MSG. Also, instead of only splitting the batch in half, I will split it into quarters, and put no MSG into the first quarter, a little into the second quarter, the advised amount in the third, and a large amount into the fourth. The subjects with tell me which one they preferred. I will then change the bowls positions and ask the people to try them again later to confirm my first results.

My original conclusion, was that my subjects would prefer food with MSG. I still believe this conclusion is true, but more results would give more support to my conclusion.

<b>NAME(s)</b>	<b>Eli Beattie</b>	<b>PROJECT NUMBER</b>	<b>P03</b>
<b>SCHOOL</b>	<b>Mill River Union High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Carolyn Raiford</b>		
<b>PROJECT TITLE</b>	<b>Gauss Gun</b>		

### ABSTRACT

The purpose of this project was to create a Gauss gun or magnetic linear accelerator and determine whether the number of balls and magnet sets affects the speed of the balls. The hypothesis was that if more sets of balls and magnets were used, then the balls would move faster. This turned out to be a fairly simple project to construct. The materials used were: a four foot long board with a groove running down the middle, 16 neodymium earth magnets, ball bearings (the mass of the ball must be greater than the mass of the magnet or else the magnet won't let the ball bearing go), photo gate, and wire nails. The groove in the board is for the balls in front of it. The first is set in motion, thus causing a chain reaction that causes the second ball after each magnet to move. The speed of the end ball is measured using a photo gate. This device uses an infrared beam to measure the speed of an object. The photo gate records the time that the beam was broken and combines it with the diameter (which must be entered before hand). The speed of the ball was measured after one magnet and then two and so on up to sixteen magnets. From these results, it was concluded that the hypothesis was correct and that there was a definite increase in the speed of the balls. This means that there must be some transfer of energy from one impact to the next.

<b>NAME(s)</b>	<b>Jonathan Beauvillier</b>	<b>PROJECT NUMBER</b>	<b>B05</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Mr. Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>Different Waters Affect On Plants</b>		

### ABSTRACT

Ever since life started on Earth water has played a huge role in growth and development. Some of the changes in water that can influence the growth and development of an organism are: pH levels, nitrates, hardness, and chlorine levels. Depending on the levels of these attributes it could have either have positive or negative affects. For my study I experimented to find out how these different substance levels affect organisms and their growth. I decided to use wheatgrass as my organism to test these changes on, as it would show more pronounced changes than other plants. For the first part of my experiment, I gathered water from several different sources including: tap water, rainfall, street runoff, field runoff, insecticide water, and herbicide water. I then tested these water samples for the attributes mentioned above. For the second part of the experiment, I setup two pots of wheatgrass for each type of water I gathered from the various places. All the specimens had the same amount of seeds and water, and were all watered at the same time. I recorded the height, color, and general quality of the plants every time they were watered. At the end of the month I put all the specimens through a drought simulation and a flood simulation. Throughout this experiment, the field runoff specimens did a substantial amount better then any of the other specimens, while the herbicide specimens did the worst, since they did not sprout. This shows that there is something in field runoff that makes it more suitable for this particular plant to grow well, compared to the other water samples. This data supports the idea that herbicide, insecticide, and street runoff all hinder to plant growth, and will cause a big decrease in plant health.

NAME(s)	<b>Michael Blackman</b>	PROJECT NUMBER	<b>P04</b>
SCHOOL	Mater Christi School, Burlington	GRADE	<b>8</b>
TEACHER	Ms. Donlon		
PROJECT TITLE	<b>I Like My Coffee Hot</b>		

### ABSTRACT

- This project tested the hypothesis that if a heated liquid is placed in multiple containers made of different materials then the liquid will cool at different rates dependent on the material the container is made of.
- Eight experiments were conducted using containers made from paper, hard plastic, soft plastic, aluminum, ceramic, stainless steel, glass and Styrofoam. Each experiment started by pouring 250 milliliters of 100 degree Celsius liquid into a container. At three, six, nine and twelve minute intervals, the temperature of the liquid was measured. After all experiments were completed, the data collected from each experiment was compared and analyzed. The drop in liquid temperature in each container at each timed interval was calculated to determine which containers kept the liquid hottest at each of the intervals and overall. Each of the containers tested performed differently and the liquid in them cooled at different rates.
- The data collected proved the hypothesis that the material a container is made from affects the rate liquid placed in a container cools and proved that certain containers are better than others are at keeping a liquid hot. An experiment variation using the stainless steel and aluminum containers with covers produced better results for both containers.
- Everyone who likes hot coffee wants to keep it as hot as possible as long as possible. This project contributes valuable real world information that will help do that. To keep coffee hot longer, put it in stainless steel or Styrofoam and put a cover on it.

NAME(s)	<b>Leah Bodin</b>	PROJECT NUMBER	<b>S03</b>
SCHOOL	Green Mountain Union High School	GRADE	<b>7</b>
TEACHER	Mrs. Surma		
PROJECT TITLE	<b>I Can't Believe I Missed That</b>		

### ABSTRACT

My goal in this project was to learn more about the phenomenon of Inattentional Blindness. I did this by showing 21 viewers of a variety of ages and genders a video. The video involved a task that viewers needed to perform, and an unexpected object that strolled across the screen. The task I asked viewers to complete was count the number of passes the team in white shirts makes. In the middle of the video, a guy in a gorilla suit walks across the screen, dances, and then walks off. I expected that younger viewers would see this unexpected object, but I was surprised to find there was no real pattern involving the viewer's ages and what they saw. There was a slight correlation with gender. In all, only 1/7 (3 out of the 21 people I tested) saw the unexpected object in the video. No adult I tested saw the gorilla. I concluded that Inattentional Blindness has more to do with how well people stay on task than age.

My results compared to results of Arien Mack and Irvin Rock, the inventors of Inattentional Blindness, were almost the same. Their data showed that approximately 75% of the people failed to detect the unexpected object, and mine showed that approximately 77% failed to see the object. Of course, you need to take into consideration we were showing different videos, and Mack and Rock tested a lot more than 21 people.

NAME(s) **Michelle Bolger** PROJECT NUMBER **B06**  
SCHOOL St. Francis Xavier School GRADE 6  
TEACHER Mary Ellen Varhue  
PROJECT TITLE A Burst of Flavor

### ABSTRACT

Purpose-The purpose of my experiment was to find out if smell affects taste.

Hypothesis-My hypothesis was if someone smells a strong scent at the same time they are tasting something different, they would have trouble identifying the taste.

Procedure-I began by getting a supply of Starburst candy and cut each in half. Next, I asked a person to do my experiment. I told them to close their eyes and then gave them a Starburst. I asked them what flavor it was and recorded if they got it right. After they did this three times, with a different flavor each time, I continued with the experiment. I dipped a Q-tip in almond extract. Then I told them to close their eyes again and to hold the dipped Q-tip up to their nose. While they smelled the Q-tip, I gave them a Starburst and asked them to guess the flavor. I repeated this three times using a different order of flavors. Then I recorded how many they got right. I repeated this project with as many people as I could.

Results-My results were that when people smelled the extract it showed a difference in the amount they correctly identified. These results tell me that smell does affect taste.

Conclusion- In conclusion, my hypothesis matched my results. It proved that smell really does affect taste. If I could have investigated further I would have tried it with more types of food and tried to reach even more people. My research question was "Does smell affect taste?" and I think it was answered by a yes.

NAME(s) **Taylor Booska** PROJECT NUMBER **B07**  
SCHOOL Fair Haven Union High School GRADE 11  
TEACHER Shaun D. Ketcham  
PROJECT TITLE Alcoholic Fermentation

### ABSTRACT

This project was designed to investigate if sugar substitutes would support alcoholic fermentation by yeast. If sugar substitutes are metabolized in fermentation, then it will produce carbon dioxide and alcohol. Fermentation flasks were set up with each of three sugar substitutes and white sugar as a control. A hydrometer was used to verify alcohol content and amount and the observation of bubbles would verify the presence of carbon dioxide. To keep the solution warm and at a constant temperature a heating pad on medium heat was used. The fermentation flasks were undisturbed for three hours and measurements were taken for alcohol percentages and carbon dioxide observations were recorded.

When the investigation was over it was found that the sugar and Sweet'n Low supported the fermentation process and the Equal and the Splenda did not support the fermentation process. The overall conclusion to this project is that the dextrose, in Sweet'n Low and the sucrose, in sugar were metabolized by the yeast. Equal and Splenda are not able to be metabolized by the yeast.

<b>NAME(s)</b>	<b>Andrew Bowen</b>	<b>PROJECT NUMBER</b>	<b>P05</b>
<b>SCHOOL</b>	<b>Mill River Union High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Caroline Raifore</b>		
<b>PROJECT TITLE</b>	<b>Experimenting with Hulls and Keels</b>		

### ABSTRACT

This project is based on hull shapes. The problem is what is the effect of hull shapes on boat speed/distance and what is the effect of a keel on a sailboat? 4 boats were made along with two larger boats, and two small sailboats. Boat 1 is a longer, narrower, motorboat type. Boat 2 is a wider and less aerodynamic boat but is much more built for heavy weights. Sailboat 1 is a regular sailboat without a keel. Sailboat 2 is a regular sailboat but it has a keel. The independent variable is the amount of tests. The dependant variable is the inches traveled and the control is the original weights. I then made a container to hold the water, which is about 3 feet long. By adding a ruler to the side of the container, distances each boat traveled can be measured. The main problem was how to control the power of the push on the boats. An idea that performs an equal amount of force into every boat test. It is a close pin that opens suddenly, flicking the boat. The only source of error is that in water the boats do not slow down very fast and they weigh much less in water. Boat 1 did go farther and faster than all other boats. Its sleek design helped it maneuver through the water much better than the other boats. It was also sturdy and could carry the fifteen quarters a decent distance. Boat 2 was one of the slowest boats but it did carry the quarters the farthest. The quarters impacted it the least and it was able to stay upright as well. Sailboat 2 was the slowest boat. It was unable to save itself from capsizing. Without a keel it could not right itself. Also, it did not hold the weight well at all and barely made it ten inches before capsizing both times. Sailboat 2 was the second fastest boat and with the keel it could save itself from capsizing. Once the weights were added however, it lurched to both sides and finally toppled over. Some sources of error could include the boats being in the water too long. They could become saturated with water and be weighted down. Another source of error could include each boat not being the same weight and mass.

<b>NAME(s)</b>	<b>Ellie Briggs</b>	<b>PROJECT NUMBER</b>	<b>B08</b>
<b>SCHOOL</b>	<b>Rutland High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Mr. Gilbert</b>		
<b>PROJECT TITLE</b>	<b>The Efficiency of Insulation</b>		

### ABSTRACT

The idea of this experiment was to determine the efficiency of various insulations. The insulations that were used are Pink fiberglass, Cellulose, Vermiculite, and Spray foam insulation. This was done by testing the insulation at the same time with controlled variables for three different testing trials. The Vermiculite was predicted to be the best at retaining the most heat.

This experiment was done by taking all insulations and placing them in separate containers. To test the efficiency, four of the exact same jars were filled with hot water and then placed in the middle of one of the insulated containers. Each jar was then capped with a thermometer inside, and then placed outdoors. Every ten minutes for one hour the temperature was checked and recorded on the data table for a total of three test trial. By doing this, the insulation that retained the most heat was found.

In an effort to control the variables, the starting temperature of the water was the same in each jar, and each setup was identical with the exception of the insulation.

By looking at the results the Vermiculite insulation was not as efficient as the Pink fiberglass insulation. After three test trial the Pink fiberglass was clearly shown to be the best at retaining heat. The next best insulation was the Spray foam insulation that was only one or two degrees colder than the Pink fiberglass each time. For the Vermiculite and Cellulose, both insulations were the coldest at the end of each experiment, not acting as efficient insulators.

NAME(s)	<u>william bright</u>	PROJECT NUMBER	<u>B09</u>
SCHOOL	<u>South Burlington High School</u>	GRADE	<u>10</u>
TEACHER	<u>mr. curtis belton</u>		
PROJECT TITLE	<u>The Ph levels found in the franklin bog and their effect on the plant specification in the</u>		

**ABSTRACT**

Approximately ten thousand years ago the land which we know today was sculpted by the movement on monumental glaciers. As these glaciers grated against the earth's surface they formed high mountain peaks, deep valleys and in this case most importantly our vast wetlands. The Franklin Bog in north eastern Vermont is one of these such wetlands, but the characteristics which make it Such a topic of interest lies just below its murky surface. The acidic bogs found in the northeastern states differ from other wet lands in many ways; my focus during this project has been the Ph levels found in the soil and ground water of the area. On 2 separate occasions I ventured into the bog to collect soil and water samples for testing. I used different plots for each sample spread throughout the central area of the bog. I was sure to locate my plots in the central area to make sure the samples truly represent the area's characteristics. Bogs have three main layers which are organized like the layers of the earth. The outer most layer is swamp land, the intermediate layer is known as leather leaf. The leather leaf layer is mostly made up of a single plant which has high resistance to the acidic Ph levels of the area, on of the few plant species to thrive in such adversity. The most inner area has many names, some simply refer to it as the inner bog, some refer to it as the sphagnum cover and some refer to it as central bog. Regardless of terminology this was the area where all my samples were collected, this was to ensure a true representation of the area's Ph make up. My original hypotheses was that the lower more acidic Ph levels would cause a deeper level of plant specification than in the surrounding lands. Throughout my study my hypothesis has been consistantly been proven correct by my observations of the plant life or the lack there off in the central bog area. My test results have shown a consistantly low Ph (ranging from 3.5 to 4.5 for water and 4 to 4.5 for soil) this also adds to my consistantly correct hypothesis I took many photos during my expeditions to show the truly barren land scape. All of my data has shown that the acidic Ph levels allow for only very specific plant species to thrive.

NAME(s)	<u>Brianna Brockett</u>	PROJECT NUMBER	<u>B10</u>
SCHOOL	<u>Manchester Elementary Middle School</u>	GRADE	<u>7</u>
TEACHER	<u>Alexandra Rella</u>		
PROJECT TITLE	<u>To Grow or Not To Grow</u>		

**ABSTRACT**

The purpose of my project was to find the optimum amount of fertilizer to grow sunflower plants the tallest. I wanted to do this project because it sounded fun, and I am surrounded by plants everyday and I thought it would be interesting to grow plants of my own. Also, I thought that I could learn a lot about plants and fertilizer, so in the future I could help my parents.

○My procedure was growing sunflower plants with different amounts of fertilizer, so I could find what the optimum amount of fertilizer to grow sunflowers. While I collected the heights of each plant I kept watering the plants with the five different treatments of fertilizer. After eleven days I started measuring the plants every three days. But I check to see if the plants needed water everyday.

○I found the plants getting 1 tablespoon of fertilizer per gallon of water had grown to be the tallest, the plants getting 1 teaspoon of fertilizer per gallon of water had been the second tallest. The plants getting 2 tablespoons of fertilizer was the third tallest. The plants getting ½ teaspoon of fertilizer per gallon of water was the second shortest and the plants getting plain water were the shortest.

○My data showed me that the plants getting 1 tablespoon of fertilizer per gallon of water was the tallest plants and it would be the best to use to promote growth. Even with the plants getting 1 teaspoon of fertilizer per gallon of water in a close second, the plants getting 1 tablespoon of fertilizer per gallon of water had grown the tallest.

NAME(s)	<b>Emily Brookman</b>	PROJECT NUMBER	<b>C03</b>
SCHOOL	Rutland High School	GRADE	11
TEACHER	Debra Hathaway		
PROJECT TITLE	<b>The Superior Moisturizer</b>		

### ABSTRACT

With dry skin being quite irritable at times, it is important to find a moisturizer that does what the title says. The whole point of a moisturizer is to keep moisture in the skin without the skin being too greasy. For best performance, the moisturizer should last a long time so that the user does not have to keep reapplying. The point of the experiment is to find which moisturizer actually retains the most moisture in an extended amount of time. To do this, twenty-four graduated cylinders were filled with ten milliliters of water and gauze was placed on top with different kinds of moisturizers on top spread lightly. The four types were the brands Bath & Body, Eucerin, Lubriderm, Vaseline and nothing was used for the control. For ten days the twenty- four graduated cylinders were observed measuring the water levels in each one. On day ten the measurement of water for Bath & Body was 9 milliliters, for Eucerin it was 8.8 milliliters, for Lubriderm it was 8.8 milliliters, and for Vaseline it was 8.6 milliliters. Based on those results, one is able to conclude that the moisturizer that retains the most moisture over a course of ten days is the Bath & Body brand moisturizer. In ten days the water level of this moisturizer went from 10 milliliters to 9 milliliters.

NAME(s)	<b>Elijah Brown</b>	PROJECT NUMBER	<b>P06</b>
SCHOOL	Manchester Elementary Middle School	GRADE	7
TEACHER			
PROJECT TITLE	<b>Solar Power Freak!</b>		

### ABSTRACT

The purpose of my project was to test how temperature affected the voltage, current, and power outputs of a solar cell. I tested the voltage, current, and power outputs in three different temperatures: 4, 26, and 49 degrees celsius. My hypothesis was that when the temperature was higher, that the voltage, current, and power outputs would be higher, and when the temperature was lower, the voltage, current, and power outputs would be lower.

I put a solar cell inside a box to control the environment, and turned a light on. Then I took the readings for each temperature. I used a hairdryer to heat up the solar cell, and used ice to cool it down. I had to control some things while I was doing the experiment like using all of the same materials in exactly the same position. The two variables were temperature and the three different types of output readings. I conducted four trials for each temperature for a total of 12 trials. I also had to keep the experiment a fair test for example by making sure that I took all of the readings at exactly the right temperatures.

I found that when the temperature was warmer, the readings were lower, and when the temperature was lower, I found that the readings were higher. I reject my hypothesis because it was incorrect, but I still wonder why the readings would be higher in colder weather, and lower in warmer weather. A further question to my project would be, how does temperature effect the voltage, current, and power outputs of a solar cell when there is pollution obscuring the path from the cell to the sun?

NAME(s)	<b>Jamie Bunch, Chris Barrett</b>	PROJECT NUMBER	<b>GP02</b>
SCHOOL	Chris the King School - Burlington	GRADE	<b>8</b>
TEACHER	Vidula Srivastava		
PROJECT TITLE	<b>Breaking Bridges</b>		

### ABSTRACT

#### Abstract

Our hypothesis about the experiment was that the bridge made out of synthetic materials would have a strength-to-weight ratio higher than or as good as the bridge made out of steel. In order to test this, we set each bridge on a stand, tied a 5 gallon bucket around it, and gradually added weight, while video taping the whole thing. After each bridge reached their maximum load limit (which we figured out when they broke), we weighed the objects that served as weight and we calculated the results. The bridge made out of synthetic materials had a strength-to-weight ratio of 104.3 and the steel bridge had a strength-to-weight ratio of 47.2, which proved our hypothesis correct.

NAME(s)	<b>Alex Bullock</b>	PROJECT NUMBER	<b>P07</b>
SCHOOL	Mill River Union Highschool	GRADE	<b>10</b>
TEACHER	Mrs. Raiford		
PROJECT TITLE	<b>Fluid Flow Rate and Viscosity</b>		

### ABSTRACT

The relation of fluid flow rate and the diameter of the tube they are moving through, as well as the viscosity of the fluid, will be tested and explained by running waters of different densities through tubing of varying diameter. This will explain many aspects of nature such as water movement through plants etc.

My father assisted in a lot of the designing and actual running of the system. After the tubing and other materials were bought we set it up and ran the first test runs. The results were great: obviously curved, easily displayable data. Then some road bumps made themselves known. The glue used on the tubes and bottle caps were not strong enough to hold the water back.

With new glue which worked much better, the water was secured. Now the real experiment was run. 1.5 liters of water was poured through each tube ten times. An almost perfect curve supported the Poiseuilles formula. However, the salt and sugar solution had graphs almost identical to the fresh water flow rate, even though the viscosities were different.

Using Poiseuilles formula backwards an attempt at finding the exact viscosities of the fluids was tried. However, the formula proved much too intricate and had variables that were not available.

Over all this project has induced much learning about flow rate, viscosity and what techniques are best to use when learning. A good experience was matched with good data and good questions for the future. Even though the results of this experiment did not coincide with the hypothesis, many questions were answered, however, some were not.

How dense must a liquid be to influence flow rate?

Can a tube be long enough to stop flow all together?

How do plants move water up 300 feet in some cases?

<b>NAME(s)</b>	<b>Sam Burke</b>	<b>PROJECT NUMBER</b>	<b>B11</b>
<b>SCHOOL</b>	<b>Mater Christi</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Michelle Donlon</b>		
<b>PROJECT TITLE</b>	<b>Beanie Babies; the Real Deal</b>		

### ABSTRACT

○The project was to see whether Gatorade, water or iced tea made kidney bean plants grow tallest. This tester did this project because they wondered what liquids would be best for watering windowsill gardens. The tester thought initially that water would probably be best because it wouldn't have sugar, food dye, etc. to potentially harm the developing seeds. Research was done about whether the electrolytes, sugars, food dyes, or antioxidants would help or hurt the plant. The procedure for this project was fairly simple. The tester needed to gather materials, pack potting soil loosely in clay pots and put three seeds in each pot. Finally, they would water each pot with one eighth of a cup of liquid every other day; one pot with lemon lime Gatorade, the next with Lipton Lemon Sweetened Iced Tea Mix, and the third with tap water. They would continue watering the plants with these liquids until the 20 day testing period was over. When the tester did this project she thought Gatorade looked like it was going to grow the most. After a while they still seemed fairly even, up until the end when both Gatorade and iced tea seemed to grow higher than water. After the 20 day testing period, the Gatorade watered plant had the highest percentage of growth, 42 percent, iced tea at 37 percent and tap water with 21 percent of the overall plant growth. The results were surprising. They indicated that Gatorade grew the tallest plants, even taller than water.

<b>NAME(s)</b>	<b>Emily Campbell</b>	<b>PROJECT NUMBER</b>	<b>S04</b>
<b>SCHOOL</b>	<b>Main Street Middle School</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Eli Rosenberg</b>		
<b>PROJECT TITLE</b>	<b>Rat Maze Project</b>		

### ABSTRACT

In my science fair project, I wanted to find out how quickly rats could use spatial memory to find the end of a maze. I thought that brown-eyed females would run the maze faster than males or red-eyed females, and that younger rats would use spatial memory more than older rats. First, I set up a classic maze, which is a wooden box shape with interchangeable panels. Then, I put each rat in the starting box, and as I removed the door, started a stopwatch to time the rat, and stopped the watch when the rat touched the marshmallows. I recorded the time, eye color, age, gender, and food for each rat. In my results, the average time of the females (106.22 seconds) was over a minute less than the average time of the males (177.33 seconds). I compared the times of a a 1-year-old brown-eyed female to those of a 1-yr-old red-eyed female, and saw that the female with brown eyes was always faster. In this project, I learned a lot more about why scientists test rats in mazes, and I learned a lot more about spatial memory and the hippocampus. In this project, I encountered very few problems. For future testing, I would like to see if rats' times steadily decrease as they make a map of the maze. I would also like to find out if rats like cheese as much as most people think they do.

<b>NAME(s)</b>	<b>Lily Chaffee</b>	<b>PROJECT NUMBER</b>	<b>G02</b>
<b>SCHOOL</b>	<b>Mill River Union High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Mrs. Raiford</b>		
<b>PROJECT TITLE</b>	<b>How Do Earthworms Affect The Growth Of Plants</b>		

**ABSTRACT**

The experiment that was designed was to see how earthworms affect the growth and development of bean plants. The hypothesis is that the earthworms would affect the growth and development of the bean plants. The independent variable is the earthworms and the dependent variable is the growth of the bean plants. The way that the experiment was conducted was to plant one tray of bean seeds with earthworms in their soil, and one tray without earthworms and record the data over a period of about three weeks on which one grew at a more rapid pace. The results of this experiment were very interesting. In the beginning of the experiment the bean seeds with earthworms were growing at a very rapid pace. They would reach about an inch of growth each day, whereas the bean seeds without earthworms were reaching about a half an inch a day. But, as the experiment went on, that all changed. The bean seeds without earthworms were beginning to grow more rapidly than the ones with earthworms. More as the experiment continued the bean seeds with earthworms just stopped growing. This then allowed the ones without earthworms to grow more and more each day. The hypothesis that was stated prior to beginning the experiment was false. This error could have happened for many reasons, some being that the seeds were not originally planted correctly, or that they did not receive an adequate amount of water and sunlight each day. Also, earthworms need a wide range of space, and these only had a small amount. Overall this experiment had quite a bit of knowledge that came along with it. This could help farmers and everyday gardeners further expand their knowledge of what they should and should not put in their soil to benefit their plants.

<b>NAME(s)</b>	<b>Stephanie Chang</b>	<b>PROJECT NUMBER</b>	<b>B12</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>9</b>
<b>TEACHER</b>	<b>Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>Reducing Phosphorus in Dairy Effluent via Constructed Wetland-Steel Slag Filter System</b>		

**ABSTRACT**

Aquatic ecosystems can be disturbed by pollutant sources such as untreated urban and agricultural runoff. In Vermont, dairy farm effluents and runoff contain excess amounts of phosphorus. Although phosphorus is an essential element for plant and animal growth, its deposition to surface waters can increase the biological productivity of surface waters leading to blue green algae proliferation and eutrophication. Excess phosphorus related to eutrophication can cause low water oxygen levels, high turbidity, reduced aquatic species diversity, undesirable taste, and fowl odor in municipal water supplies like Lake Champlain. The purpose of my experiment is therefore to evaluate the efficiency of a constructed wetland and steel slag filter system for removing phosphorus from dairy farm effluent. In the experiment, dairy effluent was passed through a treatment system consisting of a small scale constructed wetland (CW) and followed by a steel slag (SS) filter. Water samples were taken before passing through the system and after each component (CW, SS) and were analyzed for pH and dissolved reactive phosphorus (DRP). Results showed that DRP levels were reduced drastically by both the CW and the SS filter system components, however, the SS filter system showed higher DRP removal efficiencies (97 to 99 percent) when compared to the CW. Although the efficiency of the treatment system would eventually decline over time, a very high DRP treatment efficiency achieved in this experiment shows great potential of this technology to remove phosphorus from dairy effluents.

NAME(s) **Tanner Choiniere** PROJECT NUMBER **B13**  
SCHOOL South Burlington High School GRADE 9  
TEACHER Mr. Curtis Belton  
PROJECT TITLE How Backpack Weight Affects Back Pain

### ABSTRACT

Researchers suggest that a person carrying a backpack should not exceed 15 percent of their bodyweight in their backpack. Most high school students carry more than the suggested weight because of all of their textbooks and notebooks and other school materials, which could be harmful to their health. If a high school student carries more than the suggested weight in their backpack for four consecutive years then that could cause serious back pain. For my study, I am trying to figure out if carrying too much weight for a shorter period of time could affect back pain in high school students. I am having high school students carry varied weight in their backpacks, based on how much they weigh, only during the school day. My hypothesis is that after two weeks, students will report back with a noticeable amount of back pain from doing physical exercises. The test students will perform certain physical tasks to see if it causes any back pain to them. After a week the students will do the same tasks as before but it is expected that they will have a different amount of back pain from carrying the backpacks. The students will continue the experiment for two weeks so that no permanent back pain will result from the experiment. Prior to the experimentation when the students first performed the physical tasks, none of the student subjects reported back problems. I expect that when the students do the physical tasks for the second time they will start to feel mild back pain, and then after the second week a little worse back pain.

NAME(s) **Kyle Chu** PROJECT NUMBER **B14**  
SCHOOL South Burlington High School GRADE 10  
TEACHER Curtis Belton  
PROJECT TITLE Plants on the Flip Side

### ABSTRACT

Geotropism is defined as the growth of a living organism in relation to the force of gravity. Green beans, as well as other plants, grow upwards against the force of gravity. For my experiment, I will demonstrate geotropism in green beans by growing beans in four different directions. One will be oriented upright, one on its left side, one on its right side, and one upside down. By keeping all other variables, such as watering and sunlight, the same, I can determine how beans grow in response to gravity. My hypothesis is that all the beans will grow upwards no matter which way the soil is oriented. Because of this hypothesis, I am also interested in another aspect of plant development. If I am correct in saying the beans will grow up, then would the same principals apply to a plant that is constantly rotated? My thoughts are the roots and plant itself will begin to spiral in response to the changing location of gravity relative to the plant. Each day the pot containing this experimental subject will be turned 90 degrees until the experiment is over. Since watering plants that are upside down or sideways may prove to be difficult, I will construct openings that can be used for watering and when needed also be closed to keep the water and soil from spilling out. With the results in from this experiment, we can get a better understanding of the root and stem system of plants, specifically green beans. This can be applied to future experiments and development of plants in other planets or in space.

<b>NAME(s)</b>	<b>Gemma Cirignano, Kyle Bormann, Brendan Sullivan</b>	<b>PROJECT NUMBER</b>	<b>GP03</b>
<b>SCHOOL</b>	<b>Christ The King School - Burlington</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Mrs. Vidula Srivastava</b>		
<b>PROJECT TITLE</b>	<b>Backwash + Bacteria</b>		

### ABSTRACT

The purpose of this experiment was to see how much bacteria is in water from our backwash. Our hypothesis was that the petri dish containing water that was left out for 10 days will have more bacteria than the petri dish containing water that was immediately swabbed.

We performed this science experiment by preparing the petri dishes with agar. Then, we inoculated the first dish with water that a person drank out of 10 days before we performed this experiment, the second dish was inoculated with water that the same person just drank from, and the third dish we left as the control. After we did this, we waited, observing the growth of bacteria.

We observed the changes in the bacteria and noticed that it took three days for bacteria to form on the agar. 10 days later we observed that cracks were forming in the agar. After 15 days we concluded that our hypothesis was correct. The petri dish containing water that someone drank out of and then left out for 10 days contained the most bacteria.

<b>NAME(s)</b>	<b>Emily Comstock</b>	<b>PROJECT NUMBER</b>	<b>B15</b>
<b>SCHOOL</b>	<b>Green Mountain Union Middle School</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Mrs. Surma</b>		
<b>PROJECT TITLE</b>	<b>Egguality - The Quality of Eggs</b>		

### ABSTRACT

Chicken eggs have the highest quality when first laid, and their quality decreases as they age. I wanted to see if eggs from different sources changed in quality over a period of time. Using a dozen each of Organic, Store Bought, and two different farms' fresh eggs, I hypothesized that organic eggs would start off with the highest quality, and end with the highest. To test this, I weighed the eggs, and then the height of the egg white using a micrometer. I only used half of each dozen; the other twenty four eggs were left out at room temperature for four days to age. The height and weight of each fresh egg type were then put into the formula in a spreadsheet, to find the average Haugh Unit for each egg type. Four days later, I measured and put the aged eggs' data into the spreadsheet. I compared the Haugh Unit averages with the results from the fresh eggs' averages. One farm's eggs had the highest starting quality, and also the highest aged quality. The other farm's eggs had the second highest starting quality, but the lowest aged quality. The Store Bought eggs had the third highest starting quality, and the second highest aged quality. The Organic had the lowest starting quality, but the third highest aged quality. In the end, my hypothesis was incorrect, because the Organic eggs did not have the highest quality average for the fresh and aged eggs. This might have been because they had been on the store shelf for a while, and were older than the other eggs. Next time, I would try to tighten my control and have the eggs all laid around the same time.

<b>NAME(s)</b>	<b>Evan Cope</b>	<b>PROJECT NUMBER</b>	<b>S05</b>
<b>SCHOOL</b>	<b>Champlain Valley Union HS</b>	<b>GRADE</b>	<b>12</b>
<b>TEACHER</b>	<b>Glen Fay</b>		
<b>PROJECT TITLE</b>	<b>Music Vitals</b>		

**ABSTRACT**

For years sound therapy has been used to relieve stress and cure mental problems. Everyday many people use music and sound to sleep, relax, and entertain themselves. After randomly selecting a total of 12 students, 6 female and 6 male, I took vitals after having some students listen to a nature sound where as others just were lying quietly. I took vitals before, during, and after each session, twice a day. I then compared the results of all students to demonstrate how natural sounds effect, a human’s core vitals. After collecting my data, I determined that while a human's core vitals are lowered simply by lying down quietly, they are further lowered after listening to a sound effect that mimics nature.

<b>NAME(s)</b>	<b>Grace Corbett</b>	<b>PROJECT NUMBER</b>	<b>P08</b>
<b>SCHOOL</b>	<b>Renaissance School, Shelburne, VT</b>	<b>GRADE</b>	<b>6</b>
<b>TEACHER</b>	<b>Eve R. S. Dubois</b>		
<b>PROJECT TITLE</b>	<b>Wind Power</b>		

**ABSTRACT**

The purpose of my science fair project was to see if a homemade wind turbine could get much power and light up an LED light. I used a volt meter to see how much power the turbine was getting. I chose to do my project on wind power because I am very interested in renewable energy.

○I thought that the wind turbine would work because even if the turbine did not get much power, LED lights are not that hard to light up. Also, the wind turbine that I made seemed to be very stable, spun freely, and the base was very strong.

First, I built the frame for the turbine. I wrapped copper wire into coils, which I glued to the frame. I made the rotor by gluing washers to a cardboard disc and placing earth magnets on the washers. I attached the rotor to the dowel and made the turbine part. I attached the turbine part to the dowel using hot glue. I decided to use a fan to make the turbine spin so that it would spin at the same speed every time. Then, I used a volt meter to measure the energy that the turbine was generating.

○The wind turbine did not generate enough energy to light up the LED, but it seemed to be a very good model to show how a regular wind turbine is supposed to work. When hooked up to the volt meter, however, it generated 0.3 volts of electricity. I hope to do more research on this topic in the future.

NAME(s)	<u>Elijah Cory</u>	PROJECT NUMBER	<u>P09</u>
SCHOOL	<u>Hinesburg Community School</u>	GRADE	<u>8</u>
TEACHER	<u>Stephanie Konowitz</u>		
PROJECT TITLE	<u>Magnetic Levitation and Propulsion</u>		

### ABSTRACT

The science of magnetic levitation and propulsion has grown immensely in the past century, and is the soul of any MagLev vehicle. Ideas of transport by magnetic levitation first sprung up in the early 1900s, and after years of research, the futuristic propositions became a reality. Today, Maglev vehicles regularly reach speeds of over 500 km/h, the world record speed being 581km/h. The purpose of this experiment was to test how the mass of the Maglev vehicle affected the distance it was propelled. Because of growing interest and technologies in the Maglev universe, every effort to create efficient, fast, and affordable Maglev systems is valued.

What you first have to do is build the magnetic track. This can be done by taping down two long parallel strip of magnets, each with the same pole facing upwards, to a piece of wood of equal length. Then, due to Earnshaw's theorem (magnetic levitation occurs on only one axis; so there must be some sort of lateral stability present) you have to screw to the sides of the wood two pieces of Plexiglas, so that they rise up vertically and perpendicular to the base. To build the vehicle, take a piece of cardboard of equal width to the base track, and attach four magnets onto the bottom, so that when on the track, the magnets on both surfaces will repel each other; thus the levitation. To propel the vehicle, you need to attach a magnet on the back edge of the vehicle as well as place several magnets on the base track to repel this magnet.

In this experiment, the relationship between the mass of the vehicle and the distance propelled was both inversely proportional and (exceptionally) linear. From my data, I wrote a simple equation to find the approximate distance that any mass would travel for my MagLev system:  $Y = 16.45 \cdot (.328 \cdot X)$ , where Y is the distance propelled and X is the additional mass on the vehicle. I believe that this equation, however vaguely, can be applied to real life MagLev vehicles because the proportions are very similar. Overall, in this experiment, I proved that as the mass increases, the distance propelled will decrease at an inversely linear proportion.

NAME(s)	<u>Nathaniel Crane, Matthew Cecere</u>	PROJECT NUMBER	<u>GP04</u>
SCHOOL	<u>Main Street Middle School</u>	GRADE	<u>8</u>
TEACHER	<u>Eli Rosenberg</u>		
PROJECT TITLE	<u>The Power of Water</u>		

### ABSTRACT

In The Power of Water, we are trying to find out which type of water wheel produces the rotations per minute (RPM) from a gallon of water. Our three types of waterwheels are a horizontal Francis Wheel, a vertical overshot wheel, and a vertical undershot wheel. We thought that the Francis wheel would work the best due to the pressure in the tube leading to the wheel of that system. Francis wheels are used with hydroelectric dams. To test our hypothesis, we connected a gallon full of water to a tube that was connected to the wheel. We did five trials for each type of water wheel. On each trial we let the water flow through the wheels, counted the rotations, and timed how long it took for the gallon to flow through. Sometime it was necessary to videotape the wheel and replay it in slow motion to count the rotations. After our testing, we found that the overshot wheel had the most RPM for one gallon. This was probably due to the fact that the water flowing onto the top of the wheel propelled faster due to gravity. However the Francis wheel would produce more energy while using a hydroelectric dam, and the undershot wheel would generate more energy when placed over a river with a strong current. This just goes to show how different water wheels can be used in different places to make the most of total energy.

NAME(s)	<u>Emily Cutting, Katy Rinaldo</u>	PROJECT NUMBER	<u>GP05</u>
SCHOOL	<u>Mater Christi School</u>	GRADE	<u>8</u>
TEACHER	<u>Michelle Donlan</u>		
PROJECT TITLE	<u>Burnin to Learn</u>		

### ABSTRACT

This experiment analyzes how the composition and temperature effects the speed at which fabrics burn. In Experiment 1, the hypothesis was if using six different fabrics including cotton, silk, nylon, acetate, regular polyester, and fleece polyester then acetate would burn the fastest. This was based on research of similar experiments. The length of burning was measured with a stopwatch from the time the fabric was ignited until all burning stopped. Fabric was ignited while clipped to a wire. The results showed that silk was the most flammable, followed by acetate, cotton, nylon, regular polyester, and fleece polyester.

In Experiment 2, the hypothesis was that if cotton was placed in a freezer than it would burn slower than pre-heated cotton, cotton at room temperature, and cotton in a refrigerator. Pre-heated cotton was expected to burn faster than the other temperature controlled fabrics. Pieces of cotton were put in the freezer, refrigerator and microwave. The cotton was held with tongs and ignited. Length of burning was measured as before. The average of the results showed that room temperature cotton was the most flammable, followed by cotton from the microwave, freezer, and refrigerator.

Both hypotheses were proved wrong; silk burned the fastest, not acetate, and room temperature cotton burned the fastest, not preheated cotton. These results showed that silk in room temperature is the most dangerous fire hazard. People need to be aware that certain fabrics and temperatures may create a greater fire risk and impact lives.

NAME(s)	<u>Sara Daly</u>	PROJECT NUMBER	<u>B16</u>
SCHOOL	<u>Mill River Union High School</u>	GRADE	<u>9</u>
TEACHER	<u>Carolyn Raiford</u>		
PROJECT TITLE	<u>Oxygen's Role On Drosophila melanogaster</u>		

### ABSTRACT

This experiment had to do with Drosophila melanogaster, which is fruit flies. The experiment was to answer the question, is the aging process in fruit flies affected by oxygen? I thought that if the aging process in fruit flies is affected by oxygen's radical roles then, the less oxygen they get the more likely they will die faster. To prove my hypothesis I took three vial's of fruit flies and counted how many fruit flies were in each. I did this by taking a petri dish of ice and then, I put the fruit flies on that. The ice stunted them, making me able to count them. When that was done I recorded the number, then I put different layers of cheese cloth on each one and left the vials alone for a day. The next day I took the vial's and counted how many fruit flies were in each one. I counted the dead one's in each vial and found that the third vial that had the most layers of cheese cloth, had the most fruit flies that were dead on the ice and inside the vial. When I saw this I decided to try it again just to make sure that I was on the right track, and I got similar results. I came to the conclusion that the aging process in fruit flies is affected by oxygen's radical roles. Some sources of error would be that the fruit flies were multipling in some of the vials making the number in each uneven changing my results. With the results and conclusion of this project I found that it would be useful to biologist, because many biologist believe that there is a similar relationship between oxygen and aging in humans. This has been found in experiments that scientist and other biologist have done. They believe that if this is true for humans, then there is a possibility of developing a drug that could reverse some of the age-relating changes, that can debilitate the elderly.

<b>NAME(s)</b>	<b>Cody Dana</b>	<b>PROJECT NUMBER</b>	<b>P10</b>
<b>SCHOOL</b>	<b>Windsor High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Jennifer Townsend</b>		
<b>PROJECT TITLE</b>	<b>Wind Powered Battery Charger</b>		

### ABSTRACT

Most electric cars can't travel very far without having to be recharged. What if we could use wind power to supplement the battery? This project wanted to find out whether or not you could use wind power from driving a car to charge a battery. To do this I constructed a windmill and tested the voltage it gave at different speeds. My hypothesis was that I would be able to charge a battery. My results disproved my hypothesis because I couldn't generate enough electricity. However, if I had to do this project over, I think I could generate more electricity with a different configuration of diodes and successfully charge a battery.

<b>NAME(s)</b>	<b>Elliot DeMatteis</b>	<b>PROJECT NUMBER</b>	<b>M01</b>
<b>SCHOOL</b>	<b>Hinesburg Community School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Stephanie Konowitz</b>		
<b>PROJECT TITLE</b>	<b>Go DOS Go</b>		

### ABSTRACT

Many home computers can have a very long boot up time, which may help create patience in a person, but it does not help anyone get much work done. It is obvious that some computers are faster than others in this aspect of computer speed. This experiment was designed to test whether the operating system affects the boot up time and which of the four operating systems tested, Windows Vista, Windows XP, Ubuntu 8.10, and Ubuntu 8.04, were the most efficient under common circumstances and unlikely circumstances, having at least a 98% memory usage. A computer with one of the given operating systems was timed on boot up with and without maximum (or as close as possible to maximum) memory usage. Ubuntu 8.10 proved faster in both testing circumstances.

<b>NAME(s)</b>	<b>Pooja Desai</b>	<b>PROJECT NUMBER</b>	<b>B17</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Mr. Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>The Effect of Ultraviolet Radiation on Plant Growth</b>		

**ABSTRACT**

The depletion of the ozone layer has been a critical concern for scientists for many years. As the amount of ozone decreases, the amount of ultraviolet radiation reaching the Earth's surface increases. For my study, I tried to determine how excessive ultraviolet radiation would affect the growth of plants. I am trying to achieve a better understanding of how too much ultraviolet radiation will affect life. For my experiment, I had four small garden plants, four water containers, and an ultraviolet radiation box. I had two groups in my experiment, a control group and an experimental group. My control group consisted of two of the plants which were placed in an area of direct sunlight for the entire experiment. My experimental group consisted of the two other plants which were not only placed in an area of direct sunlight but were also inserted into a UV box everyday for 30 minutes. I watered each plant with the same amount of water and carefully made observations on them. I continued this experiment for five days. My results did not show a clear pattern as to how the ultraviolet radiation affected the plant growth, for the change in height of the plants had no significant pattern. My observations showed that the plants in the ultraviolet radiation box had become brown around the edges of the leaves and were starting to wither. Then I analyzed the data and found that excessive ultraviolet radiation does, in fact, affect plant growth negatively. In my results, it was evident that there was a reduction in the nutrient content of the plants (explained by the brown color). This data proved that direct ultraviolet radiation can damage plants by inhibiting growth.

<b>NAME(s)</b>	<b>Joseph Dexter</b>	<b>PROJECT NUMBER</b>	<b>P11</b>
<b>SCHOOL</b>	<b>Green Mountain Union High School</b>	<b>GRADE</b>	<b>12</b>
<b>TEACHER</b>	<b>Jonathan A. Rice, Ph.D.</b>		
<b>PROJECT TITLE</b>	<b>Immobilization and High-Throughput Screening of Zebrafish Using Poly(dimethylsiloxane) Mic</b>		

**ABSTRACT**

<b>NAME(s)</b>	<b>Caelyn Doane</b>	<b>PROJECT NUMBER</b>	<b>M02</b>
<b>SCHOOL</b>	<b>Bakersfield School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Erin Paquette</b>		
<b>PROJECT TITLE</b>	<b>Mobius Strip</b>		

### ABSTRACT

The project I chose for this year's Vermont State Science and Math Fair was the Mobius strip. I was studying the changes in the Mobius strip and its variations. My hypothesis was that if I cut the Mobius strip and its variations down their center lines, then the new strips would bear little resemblance to the original Mobius strip. When saying little resemblance I mean to say that the twists are still there but the actual shape has changed.

To start my project I had to do research so that I knew just what I was investigating. In my research I found algebraic equations looking much like calculus or advanced mathematics. At first I didn't fully understand but with some quick coaching I got to a place where I not only understood but I found them very interesting. My original plan consisted of cutting strips of paper with the same length and width. I then would make a Mobius strip by giving the strip a half-twist and connecting the two ends. Next I would cut the strip down its center line and record my results. I repeated these steps, adding a half-twist each time so that I observed a half twist, whole twist, one and a half twist and so on.

With these records I proved my hypothesis correct; and as for the algebraic equations, they became a major part of my display. Using mathematical terms I could explain how advanced mathematics and twists in a strip of paper connected. These connections made my simple experiments into a complex and fascinating project. Overall I find my results extremely satisfying.

<b>NAME(s)</b>	<b>Julia Dockum</b>	<b>PROJECT NUMBER</b>	<b>B18</b>
<b>SCHOOL</b>	<b>Fair Haven Union High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Shaun Ketcham</b>		
<b>PROJECT TITLE</b>	<b>From Heart to Hoof</b>		

### ABSTRACT

I chose to do this experiment because horse back riding is a hobby of mine and I wanted to use a topic that interests me. I didn't know much about horses' hooves and wanted to know more. While reading about hoof growth, I came across this experiment and thought it would educate me more on hooves. After reading about hoof growth in relation to heart rate, it interested me to test if hoof growth was related to heart rate. After researching, I came to the hypothesis that hoof growth is related to heart rate.

To do this experiment, I used 2 horses of different ages, a ruler, a clock, a helper, paper, and a pencil. One horse was seven months old and the other was over thirty years old. I measured both horses' front hooves and took their pulse every Sunday for six weeks. I thought six weeks would be a reasonable amount of time because a horse usually needs a trim every six weeks. As far as my results go, the hooves of Horse A (7 months old) did grow more than Horse B's hooves (30 years old). Horse A had a higher heart rate than Horse B. Both horses had a decrease in hoof growth and Horse B's hooves actually got shorter. This could be because of a natural wearing down of the hooves or possibly human error. My hypothesis was supported by these results. I learned a lot from this experiment. Hooves grow from the coronary band down toward the toe and the average hoof grows 1/4 inch to 3/8 inch per month. Younger horses have higher heart rates and hooves of horses less than one year old grow twice as fast as horses more than 12 years old. Hoof growth is effected by season, nutrition, age( heart rate), and irritation or injury of sensitive structures of the hoof. I also learned that conditioned horses have lower heart rates than horses that are not, but their hooves still grow faster.

NAME(s)	<u>Alex Drost</u>	PROJECT NUMBER	<u>C04</u>
SCHOOL	<u>Windsor High School</u>	GRADE	<u>10</u>
TEACHER	<u>Jennifer Townsend</u>		
PROJECT TITLE	<u>The effect of conductivity on the electrolysis of water</u>		

### ABSTRACT

The purpose of this experiment was to explore the relationship between various salt concentrations and conductivity, and how conductivity effects the amount of hydrogen and oxygen produced by electrolysis. It was thought that the solutions with higher salt concentrations will have a greater conductivity, allowing them to produce a greater volume of gas during electrolysis.

Electrolysis is the process of breaking water down into hydrogen and oxygen gas. This is achieved by the flow of electricity through water. Oxygen forms on the electrode carrying the positive charge because it is the anion in the compound H<sub>2</sub>O. Hydrogen gas will form on the negative electrode because it is the cation in the compound.

Hydrogen and oxygen gas were collected by using a simple electrolysis apparatus. Two electrodes were attached to the positive and negative battery terminals and into a beaker of salt and water solution. The apparatus was run for a set period of time and the gas that was collected in each solution was measured and recorded by volume. The results strongly supported the hypothesis. As the conductivity of the solution increased, more electrons were able to pass through the solution, allowing more water to be split into hydrogen and oxygen gasses.

NAME(s)	<u>Kacie Durham</u>	PROJECT NUMBER	<u>B19</u>
SCHOOL	<u>South Burlington High School</u>	GRADE	<u>10</u>
TEACHER	<u>Curtis Belton</u>		
PROJECT TITLE	<u>Effects of pH on Fruit Fly Larvae.</u>		

### ABSTRACT

Effects of pH on fruit fly larvae.

One of the world's most important and widespread pests in the fruit fly complex is the oriental fruit fly, *Bactrocera* spp. Economic loss caused by this species is extensive in Hawaii, China and other Asian countries. Unlike some studies that I have seen done with fruit flies, I'm interested in seeing if their larvae are effected by different levels of pH. For my experiment I plan to have several batches of red and white eyed fruit flies. I will have a control and then a series of other pH levels to raise the larvae in. For my study, to see just how much pH will effect the flies, I will make their food blended to a certain acid or basic level. I will feed them twice a day of whatever pH value food is assigned to that certain group. I will then take observations on how quickly the develop, how long they live, any mutations, and any mutations of their offspring. Fruit flies are typically known to live in conditions with an ample supply of food, and not every harsh conditions. I plan to also photograph the fruit flies and take note of their lifespan compared to the control. I propose that the pH will indefinitely effect the growth and life of the fruit flies. I think that since I am feeding them food with a pH attached to it, versus raising them in a slightly acid or basic environment, it will have to effect them. I am yet to analyze the data I have collected. However, I think that there is no possible way that it cannot effect the flies.

<b>NAME(s)</b>	<b>Hayden Dublois</b>	<b>PROJECT NUMBER</b>	<b>P12</b>
<b>SCHOOL</b>	Manchester Elementry Middle School	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	Scott Diedrich		
<b>PROJECT TITLE</b>	<b>Which sound absorption materials provides the most attenuation across different frequencie</b>		

### ABSTRACT

This project is the result of experimentation on which material best attenuates sound across low, medium and high frequency sound waves. I predicted that 2 inch acoustic foam would attenuate sound the best for all of the selected frequencies. I tested using 3 different frequencies (60Hz, 3150Hz, and 10000Hz) and 6 different materials. Materials were tested using both a single and double thickness.

To conduct the experiment, I downloaded the frequencies from the internet onto a test CD. By using a sound level meter, I then tested the decibel level (db) for each frequency coming out of a CD player without any material blocking it (this was my control value). I then tested the db level for each frequency with each material blocking it. Finally, I conducted three independent trials and recorded my results.

Different materials attenuated sound for each frequency. For 60 Hz frequency, the double 3 inch pillow provided the most attenuation (.05 percent). For the 3150 Hz frequency, the double 1 1/2 inch acoustic foam was the best attenuator (15.2 percent). For the 10000 Hz frequency, the 2 inch acoustic foam performed the best (20 percent). Overall, these materials were some of the softest and thickest items tested. Conversely, the harder and denser materials generally absorbed sound the least.

In conclusion, my project demonstrated that the amount of sound that materials can absorb depends on the frequency of the sound. The acoustic foam and pillow generally attenuated sound the best. I determined that my hypothesis was partially correct since 2 inch acoustic foam attenuated the best for the highest frequency sound. Overall, I learned that sound absorption is affected by different frequencies because some materials really attenuated well within certain frequencies, but other materials did not.

<b>NAME(s)</b>	<b>Hannah Dusharm</b>	<b>PROJECT NUMBER</b>	<b>C05</b>
<b>SCHOOL</b>	St. Francis Xavier School	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	Mary Ellen Varhue		
<b>PROJECT TITLE</b>	<b>Milky Ways</b>		

### ABSTRACT

The purpose of my experiment was to test if the pH of milk changes as it gets older. My hypothesis was the older the milk was the lower the ph would be. The constant variable was the amount of cups in the total experiment, the cabbage juice added to each cup to test pH and the cup brand. The manipulated variable was the age of the milk and the responding variable was the pH as the milk got older. To find the pH I added 2 tablespoons of cabbage juice to the 2 tablespoons of milk that was in each cup. The cups were at different temperatures; that way some aged faster than others. I recorded and observed the milk's color and appearance for up to three weeks. I checked to see if the color changed pink or if it stayed purple when I added cabbage juice. The results of this experiment proved my hypothesis to be right. The older the milk was the more acidic it got or the more pink. Compared to the original milk test the colors have changed dramatically. I also found that temperature had a big effect on how quickly the milk became more acidic.

<b>NAME(s)</b>	<b>Sheamus Fagan</b>	<b>PROJECT NUMBER</b>	<b>B20</b>
<b>SCHOOL</b>	<b>Rutland High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Timothy Gilbert</b>		
<b>PROJECT TITLE</b>	<b>Bacterial Inhibitors and the Effects on Bacterial Growth</b>		

### ABSTRACT

Germ s are everywhere on the planet. Some are beneficial, and some are not. The purpose of this project is to compare the effectiveness of products that claim to inhibit the growth of deadl y bacteria. By comparing the effectiveness, the consumer can understand what type of results to expect from the products they purchase, and may even be able to alter their purchasing decisions to reflect those expectations. At first, the idea was only to test products on bacteria that had been recently transplanted to the test Petri dishes, but further research revealed that experimenting with bacteria that had already been growing in the dishes would be conducive to clearer and more supported test results.

○The effectiveness of a product was determined by growing bacteria inside of a Petri dish, and, depending on which trial was being run, exposing the bacteria to bacteria inhibitors at the outset or early to middle stages of growth. The bacteria inhibitors were on small dots that were placed directly in the path of bacteria growth. After incubating for several days, the dishes were observed for effectiveness of the products.

○The most effective products were the general cleaners, Crest Mouthwash and Lysol Cleaner. Hydrogen Peroxide and Isopropyl Alcohol sounded promising, but performed poorly. Bacatracin Ointment and Clindamycin Phosphate had such little effect that it might seem they weren't even there at all.

○These results did not match my hypothesis, which stated that the hydrogen peroxide or isopropyl alcohol would be the most effective. Further research suggests that the results are due to the presence of more than one antibacterial agent in the Crest and Lysol products, only one agent in the hydrogen peroxide and isopropyl alcohol, and the inability for bacatracin and clindamycin phosphate to adequately move through the path of bacteria, as they are gel-like in constitution.

<b>NAME(s)</b>	<b>Sabrina Farmer</b>	<b>PROJECT NUMBER</b>	<b>G03</b>
<b>SCHOOL</b>	<b>Mater Christi School</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Michelle Donlon</b>		
<b>PROJECT TITLE</b>	<b>The effect of Rock Salt, Table Salt and De-icer on plants</b>		

### ABSTRACT

Can beans grow in rock salt, de-icer, and table-salt? The hypothesis for this project was if plants are grown in de-icer, rock salt and table-salt then only the control and table-salt will be able to grow. During research for the project many resources stated that de-icer has many toxic chemicals in it, mainly ethylene glycol, methyl alcohol and silicone polymer, so plants are killed by it. Research also said that rock salt had chloride and sodium in it and chloride was harmful to plants. Then research said that salt is the same thing as rock salt except more purified.

○Setting up the experiment required pots, soil, and more. The experiment was set up by planting sixteen plants in soil. Twelve of the sixteen pots required the addition of salt, de-icer, or table-salt. Then a bean was added to each plant. The project required the growth of the plants for 2 weeks.

○When the experimenting was over the control grew to be an average of 7.1 centimeters. The beans with additives in them did not grow. The beans were examined under a dissecting microscope and mold was found on the beans in de-icer. The beans in table-salt were a tint lighter than the other beans, and the beans in rock salt had a very small amount of mold.

○The experiment proved rock salt, de-icer, and table-salt all had a negative effect on the environment. Every time we put salt on are roads, and use de-icer to melt ice, we are killing plants.

<b>NAME(s)</b>	<b>Christopher Farnam</b>	<b>PROJECT NUMBER</b>	<b>C06</b>
<b>SCHOOL</b>	<b>St. Francis Xavier School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Mary Ellen Varhue</b>		
<b>PROJECT TITLE</b>	<b>Fabrics on Fire</b>		

### ABSTRACT

I wanted to investigate which fabrics would be more or less flammable than others. I thought that fleece would burn faster than other fabrics because it is loosely woven. I tested several materials looking for how long they took to ignite and how long they took to burn completely. I started my procedure by cutting 5 X 5 inch squares of each fabric that I chose to use for my project. Then, under adult supervision, I put them in a clamp stand leaving as much of the fabric out as possible. I timed how long it took for each to light and how long it took for each to burn. My results were inconclusive because most of the fabrics were manmade and they melted instead of burning. My results did show that my hypothesis was wrong because it took quite a while for the fleece to melt.

<b>NAME(s)</b>	<b>Elizabeth Fell</b>	<b>PROJECT NUMBER</b>	<b>B21</b>
<b>SCHOOL</b>	<b>St. Francis Xavier School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Mary Ellen Varhue</b>		
<b>PROJECT TITLE</b>	<b>Slushies Not Bricks</b>		

### ABSTRACT

One problem horse owners in Vermont frequently run into in barns is that water left for horses will freeze. The purpose of my experiment was to see what would lower the freezing point of water the most but still be palatable to horses. My hypothesis was that table salt would lower the freezing point the most, but that apple juice would be the most palatable. To do the freezing point experiment, I collected the following: lemon-lime Gatorade (powdered), apple juice, table salt, lite salt, and Apple-a-day equine electrolytes. I added the needed amount of each substance to  $\frac{1}{2}$  cup of water. I placed each glass in the freezer and checked the temperature and the amount of ice every 10 minutes. My results showed table salt and Gatorade lowered the freezing point the most. I then tested these two liquids for palatability. To test this I placed buckets of Gatorade flavored water and salt water along with fresh water in each of the horse's stalls. The buckets were left overnight. My results showed that the horses preferred fresh water to either alternative. I found that the table salt and Gatorade did lower the freezing point however the horses did not find either palatable. I found that nothing beats fresh water for horses to drink.

NAME(s)	<b>Sam Ferro</b>	PROJECT NUMBER	<b>B22</b>
SCHOOL	Rutland Senior High School	GRADE	<b>11</b>
TEACHER	Timothy Gilbert		
PROJECT TITLE	<b>The Effect of Music on the Heart Beat</b>		

### ABSTRACT

The purpose of this experiment was to see how music affected the heart rate. To do this I used a heart monitor on a person while they were listening to different songs that were of different genres and tempos. There's always going to be error, so of course, my experiment isn't 100% accurate, but i feel that it is pretty accurate.

Trends that I found with the data are that if the song has a slow tempo, usually the heart rate will go down, and if not, it will stay close to what the person's resting heartbeat was. If a song has a faster tempo, the person's heartbeat always either increased or stayed the same. I also found out that personal interest has nothing to do with the song affecting the heart. After asking the people which song was their favorite, it was really inconsistent in how the song changed the heartbeat.

NAME(s)	<b>Michaela Finneran, Bailey McCarthy</b>	PROJECT NUMBER	<b>GP06</b>
SCHOOL	Mater Christi School	GRADE	<b>8</b>
TEACHER	Michelle Donlon		
PROJECT TITLE	<b>"Oil Pollution Solution"</b>		

### ABSTRACT

○The purpose of this experiment was to determine whether natural materials or manmade materials cleaned oil most efficiently. The hypothesis was that if the oil was cleaned with hair (Natural Materials) and cotton socks (Manmade Materials) then the most oil would be removed, as compared to feathers and seaweed (Natural Materials) and Saran wrap and cheesecloth (Manmade Materials).

The reason for this prediction was because of an article we read about an oil spill in the Philippines, and how the Philippines Coast Guard put out a Public Broadcast Announcement asking for large amounts of hair. The hair was used to clean the oil, and if this was being used to clean the oil in the Philippines, our assumption was that it must be effective. The socks were chosen because we thought that the cotton socks would perform well because the fibers in the cotton are tightly packed together, therefore more absorbent.

The procedure for the testing started out by creating a Graph Top for the box the experimenting was done in (shown below). Then, we filled the Tupper Ware box with 4 cups water, and 1/8 cup of sea salt. Then, poured in 1/3 cup of motor oil, attached the Graph Top and took a picture of the uncleaned oil. Then, we tested each material twice, and took picture before the oil was cleaned, and after. The results showed that feathers and cheesecloth removed the oil most effectively, proving both hypothesis wrong.

**NAME(s)** Amelia Fontein **PROJECT NUMBER** G04  
**SCHOOL** Mill River Union High School **GRADE** 10  
**TEACHER** Carolyn Raiford  
**PROJECT TITLE** Mill River Union High School

### ABSTRACT

In this experiment, the movement of several pollutants through soil was tested. Dish soap, kerosene, motor oil, and E. coli bacteria (independent variables) were tested. The movement of the pollutants in the soil was observed. Water was drained through the soil as a control group. It was expected that kerosene would travel fastest through soil because it has the lowest viscosity. It was also predicted that if water containing E. coli was run through soil, then the water sample collected would contain E. coli. To test pollutant movement, the travel rates (dependent variable) of dish soap, kerosene, and motor oil were tested over 12 hours. To test E. coli movement, water samples containing E. coli were run through the soil. A Millipore filter was used to filter bacteria out of the water. After completing this procedure, it was possible to count the number of fecal colonies (dependent variable) present in each sample. Two trials of each portion of the experiment were completed. Some sources for error were: the viability of the Millipore Filter equipment, the inconsistent moisture composition of the soil, and the incubation time for the E. coli. The results proved that kerosene did indeed move the fastest through soil. It was concluded that this was due to kerosene's low viscosity and the soil's lack of absorption of the pollutant. The E. coli trials did not come out as expected. The bacteria-contaminated water samples yielded the same amount and, in some cases, fewer fecal colonies than the control group (distilled water). It was concluded that this was because the soil contained a significant amount of E. coli before the water samples were tested. These conclusions can be applied to the huge threat that runoff pollution poses to the world's food supply.

**NAME(s)** Beth Foster **PROJECT NUMBER** B24  
**SCHOOL** Rutland High School **GRADE** 11  
**TEACHER** \_\_\_\_\_  
**PROJECT TITLE** End Pain Fast

### ABSTRACT

My project was simply to test which pain reliever would dissolve the quickest in the human stomach. This is important in choosing which pain reliever we take because it will tell us which pain reliever will be ready to be distributed into the blood stream and begin to work the fastest. To test this I decided to recreate the pH level of the acid contents in the human stomach and see how long it takes for the pills to dissolve. The Pain Aid Generic Tablets dissolved the fastest, dissolving in only 20 seconds. In contrast, the slowest dissolving medicine, Aleve tablets, took 41 minutes and 25 seconds. This tells us that if we're looking for something for quick pain relief, Pain Aid Generic Tablets are what you should take. However, if you want lasting pain relief, you should take Aleve Tablets.

NAME(s)	<b>Tara Gallagher</b>	PROJECT NUMBER	<b>C07</b>
SCHOOL	<b>Mater Christi</b>	GRADE	<b>6</b>
TEACHER	<b>Michelle Donlon</b>		
PROJECT TITLE	<b>Current Solutions</b>		

### ABSTRACT

In the experiment of Current Solutions, three solutions were tested for their current- sodium chloride solution, sodium bicarbonate solution, and sucrose solution, with tap water as control group. To find this data, a multimeter was attached to a DC power supply, and two electrodes were created using the wires from the multimeter and another from the power supply. The solutions were tested at 12 volts, and 1 teaspoon of solute was added to each. The hypothesis was that the sodium chloride solution would have the most current, then sodium bicarbonate solution, tap water, and lastly the sucrose solution.

The main idea of the topics researched was conductive materials that could prove the cause of my results. The hypothesis proved mostly correct, except for the fact that sucrose slightly increases the current. The data ranged from 4 milliamps to 780 milliamps. Once the data was collected, Ohm's Law,  $V/I$ , or voltage divided by current, was used to find the resistance. The next branch of my experiment tested the current of each solution as the amount of solute increased by one quarter teaspoon. The current increased dramatically for the sodium chloride and sodium bicarbonate, but adding sucrose only affected the current one milliamp. The conclusions drawn from this experiment are these- ionic solutions conduct the most electricity, and the amount of solute does affect the current.

NAME(s)	<b>Patricia Gallego Delgado</b>	PROJECT NUMBER	<b>B25</b>
SCHOOL	<b>Mount St. Joseph Academy</b>	GRADE	<b>10</b>
TEACHER	<b>Timothy McCue</b>		
PROJECT TITLE	<b>The dehydrating effect of alcohol in the skin</b>		

### ABSTRACT

The humans have a hormone (ADH), which regulates the water level in your blood; alcohol inhibits that hormone and also affects every cell membrane in the body changing their fluidity. The purpose of this project is to find what type of alcohol has a greater dehydrating effect in your body. To prove this fact I am going to use different types of alcohols to inject them in two different fruits (apples and oranges), that have a cellular tissues as human skin. My expectations are those with major percent of alcohol will convert the fruits cell membranes softer and will cause a greater dehydrating effect in the human skin.

NAME(s) Kaitlyn Gawet PROJECT NUMBER P13  
SCHOOL Mount Saint Joseph Academy GRADE 9  
TEACHER Timothy McCue  
PROJECT TITLE Environmental Conditions Effects on the Quality of Fingerprints on Glass Surfaces

### ABSTRACT

In my project, I am going to test and find out which environmental conditions effect the quality of fingerprints on glass surfaces. I will test three different people, all women of ages 14, 25, and 49. I will use ice cubes to represent cold weather. I will use hot water to represent warm or hot weather and I will also take the normal body temperature print. I will find which print shows the best on glass surfaces and which weather condition works the best. I believe that the hot water print will have the best clarity out of all of the prints taken because I believe the moisture left on the glass from the heated print will pick up the black powder the best.

○You will take one person and take their finger and hold it to the glass surface. You will lift their print. After doing this for all three people you will test each the ice cubes and the hot water to see which temperature will show the best and will be the clearest. I concluded that the normal body temperature print came out the best and the clearest in the overall project.

NAME(s) Rachel Giffin PROJECT NUMBER S07  
SCHOOL Rutland High School GRADE 11  
TEACHER Debra Hathaway  
PROJECT TITLE Learning and Information Retention

### ABSTRACT

Sometimes specific knowledge that is unused in daily life is lost, however though logical reasoning the correct response can be found. This science fair experiment tested to see whether or not adults retained information they learned in middle school. To do this, a test was made up using the science textbook the students use at Rutland Middle School. This test was composed of thirteen multiple choice questions. It was given to 74 adults and 79 8th graders. The results surprised the researcher. The adults had a higher average score (70.2) than the students (57.7). This outcome may have been because of unwillingness from the students. If the experiment were to be done again, the researcher would reword some questions and include a wider variety of questions.

<b>NAME(s)</b>	<b>William Gilbert</b>	<b>PROJECT NUMBER</b>	<b>B26</b>
<b>SCHOOL</b>	<b>Mount St. Joseph Academy</b>	<b>GRADE</b>	<b>9</b>
<b>TEACHER</b>	<b>Timothy McCue</b>		
<b>PROJECT TITLE</b>	<b>Effects on Plants With and Without Sulphur</b>		

### ABSTRACT

○In my science fair project I wanted to see what the effects on plants would be if some received sulphur as a nutrient and if others did not. To start out I made my hypothesis, ðIf a plant does not receive a source of sulphur, then there will be noticeable defects in the plant.ö While researching this I found that plants that did not receive enough sulphur would have lesser crop yields and problems. For growing I decided to use hydroponics, a HoaglandÆs solution for the nutrients, and twenty four Wisconsin fast plants. I did this so I would be able to know what nutrients the plants were receiving and be able to leave out sulphur in the experimental group (without sulphur). My results came out to be the opposite of the information that I had found while researching. At day nine of growing the average growth of the roots were about twice as long and the stalks also much longer. On day 18 the roots and stalks were substantially larger in the experimental group than the control group (with sulphur). Also there were some factors that could have altered results like the plugs to hold the plant were not all made of the same material. My final conclusion is that the plants that did not receive a source of sulphur grew much better than those that did.

<b>NAME(s)</b>	<b>Chantal Girard</b>	<b>PROJECT NUMBER</b>	<b>B27</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Curtis R. Belton</b>		
<b>PROJECT TITLE</b>	<b>Exposure of Felines to Heartworm Disease in Vermont</b>		

### ABSTRACT

Feline heartworm disease originates when an infected mosquito transmits heartworm larvae into a cat's blood system. These larvae then migrate throughout the body and develop into adult worms after 3-4 months. Due to the fact that this is a mosquito transmitted infection, it is often assumed that outdoor felines are more affected by the disease than indoor felines. The main purpose of my study is to find out through antibody and antigen testing whether indoor cats in the state of Vermont are as exposed to heartworm disease as outdoor cats. I hypothesize that indoor cats are not as exposed to heartworm disease as outdoor cats in Vermont. In my experiment, I will be testing 200 cats between Affectionately Cats Feline Vet Clinic and a few humane societies throughout the state. I have purchased 200 feline antibody and antigen tests to test for heartworm in each of the cats involved. Before performing the blood draw, I will find out whether the cat is indoor or outdoor, and write down this information in a data table. When drawing the sample of blood, the same humane technique that is used by trained veterinary technicians will be used by the veterinarians and myself to keep the cat as comfortable and safe as possible. After I have drawn the cat's blood, the cat will be returned to its owner or designated area in the humane society and I will immediately take the sample to the lab to perform the heartworm antibody and antigen tests with the help of the trained technicians. I expect that the results I find will first support my hypothesis in showing that outdoor cats are at a higher risk of transmitting this disease than indoor cats, and potentially even help veterinarians in Vermont recognize the predominance of feline heartworm disease.

<b>NAME(s)</b>	<b>Hannah Gleason</b>	<b>PROJECT NUMBER</b>	<b>B28</b>
<b>SCHOOL</b>	<b>Northfield High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Cynthia Tomczyk</b>		
<b>PROJECT TITLE</b>	<b>The Effect of Changing Protein Intake on the Weight of Mice</b>		

**ABSTRACT**

Protein is essential to diets which provide energy and help build muscle in all animals. This experiment tested the effects of different amounts of protein on the weight gain of mice and was done over three different experiments with twelve mice, three in each group. The first and second experiments were done over twelve days while the third was sixteen days. The data from this experiment was obtained by weighing the mice, averaging the weights, and then finding the percent change. For my second and third experiment I fed the mice 1g, 2g, or 3g depending on the group. In a normal mouse diet the typical intake of protein is 15%-during this experiment my control was fed 15% protein while the other three groups were fed an increased amount. Each successive group was fed the 15% protein food plus an additional amount of 1g, 2g, and 3g per mouse depending on the group. Both the second and third experiments had similar patterns and trends. Experiment two control had a total percent change of 8.1%, the 1g group had 18.7%, the 2g group had a total percent change of 21.1%, and the 3g group had 20.1%. Experiment three control had a total percent change of 6.4%, the 1g group had 12.9%, the 2g group had a total percent change of 14.4%, and the 3g group had 12.9%. The total percent change in both continued to increase from the control to the 2g group and then decreased slightly in the 3g group. The mice given more protein will have a greater percent change and as mice are given more than 2g the percent change will decrease.

<b>NAME(s)</b>	<b>Rebecca Goldberg</b>	<b>PROJECT NUMBER</b>	<b>B29</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>Phosphorous Runoff</b>		

**ABSTRACT**

Phosphorus exists in water as phosphates which are dissolved and attached to particles or in organisms found in the water. It occurs naturally in organism waste, and is also a component of many man-made fertilizers and automatic dishwasher detergents. Phosphorus is brought into a drainage basin by water from runoff of precipitation, agricultural or landscape irrigation, and the discharging of effluents. For my project, I studied the affects of precipitation runoff by testing for phosphorus before and after precipitation, in different seasons, and in different locations and types of bodies of water. I believe that the season will not affect phosphorous levels, and, after precipitation, all bodies will be phosphorus abundant. Before precipitation, phosphorus will lower in concentration because of the lack of runoff. About every two weeks from October to April, before and after precipitation, phosphorus testing strips were dipped into each body of water and amount of phosphorus per milligrams per Liter were recorded. Using before precipitation as my control group and after precipitation as my experimental group, I tested Potash Brook and Muddy Brook in South Burlington along with the Kennedy Drive and Cobblestone Circle Retention Ponds in South Burlington, and Lake Champlain and a trickle leading into Lake Champlain in Burlington. I chose these so I could explore the different types of bodies of water, such as Lakes, Brooks, and Retention Ponds, whose main purpose is to hold chemicals such as Phosphorus that drain from detergent or fertilizer in neighborhoods. So far, the data show that before precipitation, phosphorous levels are lower in all bodies of water and that after precipitation, phosphorous levels rise in all water samples with retention ponds having the highest amount. This is most likely because retention ponds are designed and located to trap phosphorous runoff and prevent lake contamination.

NAME(s) Kelsey Gordon PROJECT NUMBER B30  
SCHOOL Mount Saint Joseph Academy GRADE 9  
TEACHER Timothy McCue  
PROJECT TITLE The Affect of Road Salt on Fresh Water Ecosystems

### ABSTRACT

I conducted an experiment in order to find out the affects that the road salts we use have on fresh water ecosystems. In order to do this I used fresh water gold fish and tested what the affects of both rock salt and sodium chloride had on the fish. I did this by adding a certain amount of both sodium chloride and rock salt to both sets of fish. I also had a control group of fish to show the different affects between the ecosystems with road salt and the ecosystem as it was normally. I came to the conclusion that both rock salt and sodium chloride have a major affect on our fresh water ecosystems, when we use them on our roads.

NAME(s) Otis Gray PROJECT NUMBER P14  
SCHOOL Rutland High School GRADE 11  
TEACHER Ann Marie Mahar  
PROJECT TITLE Perfect Paper Plane Project

### ABSTRACT

The idea of making something as entertaining and simple as a paper airplane into a realistic, well-engineered physical being beckoned my interest into undergoing research on how to approach the creation of the perfect paper airplane. After researching the topic, it was determined that the surface area and its affect on the reacting air is very crucial to the success of the plan. My hypothesis states that the plane should have a long, wide wingspan, stabilizers on the ends of the wings, a flat nose, and very well distributed weight. In order to analyze the type of model that is ideal for distance throwing, I decided to make a gamut of different model paper airplanes. To determine the successfulness of a given model plane, I would record the distance that the plane flew from the spot where they were released. In the process of this project, over fifty different planes were made, twenty of which were selected to be used in the experiment because of their physical contrast with each other. In a controlled environment with no wind and few obstruction objects, the planes were thrown across the area over a long rolled out measuring tape. Three trials were recorded for each plane to avoid error. The distances were recorded in inches and compared to determine the best plane. An unexpected victory by a small, simple plane led me to believe that it is not surface area alone, but more crucially surface area compared to overall size that affects the plane.

<b>NAME(s)</b>	<b>Emily Guerra</b>	<b>PROJECT NUMBER</b>	<b>S08</b>
<b>SCHOOL</b>	<b>Green Mountain Union Middle/High School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Mr Garvin</b>		
<b>PROJECT TITLE</b>	<b>Music to My Ears</b>		

### ABSTRACT

In my research I found that listening to music with a heavier beat you are able to concentrate more on what you are doing. This is because the heavy beat speeds up your blood flow through the brain, helping you to feel more awake. If you were to listen to music with a softer beat than you would be put into a meditative state, because your blood flow isn't going as fast through your brain. In my project I wanted to see what kind of music would help a student to study better. My hypothesis was that music with a heavier beat would help the test subjects to concentrate more. I thought this because with a heavier beat increases your blood flow through the brain.

<b>NAME(s)</b>	<b>Sarah Guth</b>	<b>PROJECT NUMBER</b>	<b>B31</b>
<b>SCHOOL</b>	<b>Rutland High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Debra Hathaway</b>		
<b>PROJECT TITLE</b>	<b>Too be clean or not to be</b>		

### ABSTRACT

Many of the most common diseases are found in contaminated drinking water. The contamination can be from microorganisms such as Diarrhea, Typhoid, Hepatitis and Cholera. Our drinking water can come from wherever. As different precipitants; snow, seep through the soil into our water systems these contaminants can come in contact with our drinking water. The people in the Guth household wonder if they made the right decision to move to a rural area instead of urban. Therefore, the question is on which snow would be cleaner rural or urban? It is predicted that the snow on rural grounds would be cleaner due to the fact that there are not as many automobiles, houses, and people. Today, 75 percent of the United States' inhabitants live in urban areas. However, cities occupy only 2 percent of the country. Rural areas occupy the remaining 98 percent. Showing from these facts that there is a lot less land occupied by the city but more people living there. On the contrary there is more land and less people in rural areas. This means less pollution from automobiles, garbage, humans and many others that urban areas have. From the facts and common sense one can come to a conclusion that rural areas are cleaner. Using the materials of agar, petri dishes, a sterile wire, and an area to incubate the agar dishes. The bacteria grew and then the researcher determined the different types of microorganisms on the cultures. After doing the experiments by collecting ten samples of snow, two for each site, from urban and rural areas the states hypothesis was proven to be correct.

NAME(s)	<u>Sarah Hackett</u>	PROJECT NUMBER	<u>B32</u>
SCHOOL	<u>South Burlington High School</u>	GRADE	<u>10</u>
TEACHER	<u>Curtis Belton</u>		
PROJECT TITLE	<u>Artificial Turf vs. Natural Turf</u>		

### ABSTRACT

○Within the past forty years or so, artificial, or synthetic, turf has become very popular. It is a staple at many high schools and college athletic fields but problems have occurred with the new technology and some are pretty severe. With my study I compared artificial turf and natural grass and see on which surface injury occurs more and I also looked at which surface is linked to more infections from abrasions. I hypothesize that artificial turf causes more injury during activity and that people are more apt to develop infections from abrasions caused by falls on the artificial surface. I have been looking at previous cases and amounts of injuries occurring on South Burlington High School's turf alone and also I have been researching the cost of upkeep of both types of turf and previous college studies that have results linking to knee injury and where it occurs most on. At the conclusion of the study I expect that sports performed on artificial turf will cause more injuries and it will spread infections more. The data, so far, have shown artificial turf spreads infections like MRSA more because that turf breaks the skin more easily and tears at it. The infection being carried by a person is then on the turf and can easily enter someone else. As for injuries, artificial turf has been shown to have more knee injuries, like ACL, because the turf is easier to catch your foot on, it also has "turf toe", and many more cases of dehydration. There are still many injuries on natural turf fields though, because the surface is unpredictable and often uneven and bumpy. It can be dangerous when wet because it gets very slippery. So far the findings support the hypothesis.

NAME(s)	<u>Natalie Hajj</u>	PROJECT NUMBER	<u>P15</u>
SCHOOL	<u>Mount Saint Joseph Academy</u>	GRADE	<u>9</u>
TEACHER	<u>Timothy McCue</u>		
PROJECT TITLE	<u>Paper Towel Testing</u>		

### ABSTRACT

The experiment that I am conducting is going to see what brand of paper towel is the strongest and the most absorbent. I will have two different experiments, one to test the strength and another to test the absorbency, with four different paper towel brands. With the help of a friend I will find out which of the four brands is the best (Bounty, Kleenex Viva, Smart Cents, and Sunrise), almost the same way the makers of the towels do.

NAME(s)	<u>Caitlyn Hartigan</u>	PROJECT NUMBER	<u>S09</u>
SCHOOL	<u>Mill River Union High School</u>	GRADE	<u>10</u>
TEACHER	<u>Carolyn Raiford</u>		
PROJECT TITLE	<u>Time Flies?</u>		

### ABSTRACT

The goal of this project was to determine if there is a relationship between heart rate and time perception. To do this, the hypothesis which stated if heart rate is indirectly related to time perception and heart rate is increased, then the amount of time perceived will decrease was tested in 20 high school girls between the ages of 14 and 17. The independent variable is heart rate; the dependent variable is the actual time perceived; and the control variable is the resting heart rate. Each subject was asked to estimate a minute without the aid of a clock, watch, or other timer, twice while sitting with a relaxed heart rate, and twice while running, with an accelerated heart rate. The hypothesis is false. When taking the mean averages of all the cases combined, the data indicated a longer actual time estimated when the heart rate was elevated. Also, based on the individual cases, half of the subjects estimated lower actual times to be one minute when running as compared to their resting times; the other half estimated higher actual times to be equal to one minute when running, when compared to their resting times. Based on these results, it is impossible to make a definitive conclusion as to how or whether heart rate affects time perception.

NAME(s)	<u>Abby Harvey</u>	PROJECT NUMBER	<u>PN00</u>
SCHOOL	<u>Christ the King School</u>	GRADE	<u>8</u>
TEACHER	<u>Amy Wright</u>		
PROJECT TITLE	<u>Do Different Dilutions of Bleach Affect Bacterial Resistance?</u>		

### ABSTRACT

I am trying to prove if different dilutions of bleach affect bacterial resistance. I think that the area of inhibition will be greater with a higher concentration. I am doing this experiment because I find microbiology interesting. I think it is amazing that they have their own little world inside something so little in our world. First, I mixed together concentrations of 50%, 25%, 10%, and 5% solutions of bleach and water. Next, I swabbed 20 Petri Dishes with bacteria from different locations. I swabbed one place for each set, with 5 sets of 4. I placed a single disk, one for each concentration and each set. I incubated them and observed. Next, I measured and recorded the diameter of the zone of inhibition using millimeters. I observed that the higher concentration mainly had a larger inhibition area. Therefore, the bacteria are less resistant to higher concentrations. I also noticed that areas that have been exposed to bleach before, like the washing machine and the toilet, had less resistance to the concentrations. My hypothesis was right because the area of inhibition was greater with a higher concentration.

**NAME(s)** Sarah Harvey **PROJECT NUMBER** C08  
**SCHOOL** Christ the King, Rutland **GRADE** 6  
**TEACHER** Mrs. Wright  
**PROJECT TITLE** What best prevents apples from oxidation for the longest amount of time?

### ABSTRACT

For my science fair project I tested to find out which preservative kept Macintosh apples from going through oxidation for the longest period of time. I coated my sliced apples with the preservative, put them in a Pyrex dish, and put dish in the refrigerator. I checked them every 10-30 minutes, and when they got brown enough that I was not willing to eat them anymore, I recorded how long it had been since I had put them in. If the apples went for more than 24 hours without turning brown, I recorded them as 24+ hours. I thought that using a coat of Jell-o to create a barrier between oxygen and the apple would work the best out of my seven preservatives. The results are as follows: The three different juices with citric acid, the vacuum sealer, and the salt worked the best; the salt and Jell-o was after, and finally, the Debbie Meyer Green Bag came in last. I did not think that the salt would work as well as it did, even though it was once used as a preservative.

**NAME(s)** Katie Haseltine **PROJECT NUMBER** P16  
**SCHOOL** Green Mountain Union Middle/High School **GRADE** 8  
**TEACHER** Mr Garvin  
**PROJECT TITLE** What to Know Before You Throw

### ABSTRACT

There are many factors that can affect a person's concentration. Family issues, judging themselves negatively, and mood is some of the reasons why people lose their concentration. I tested what factors affect a person's free throw. My hypothesis is that Gatorade, water, and low noise will improve someone's free throw, and that ice water and high noise will worsen a person's free throw. Each subject was to shoot 50 free throws for each variable. My results show that the subjects improved when they drank water and listened to high and low noise. Gatorade worsened most subjects' shot. Ice-cold water was equal with their control. Part of my hypothesis was proved wrong. Gatorade did not improve for the subjects, instead high noise did. Ice water didn't change; it stayed the same as the subjects' control.

<b>NAME(s)</b>	<b>Sean Healey, Camille Fontaine-Morin</b>	<b>PROJECT NUMBER</b>	<b>GP07</b>
<b>SCHOOL</b>	<b>Christ The King, Burlington</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Mrs. Vidula Srivastava</b>		
<b>PROJECT TITLE</b>	<b>Wave of Destruction</b>		

### **ABSTRACT**

Our hypothesis is that the damage caused by a tsunami depends upon the slope of the land form that the wave strikes. This knowledge would provide information on which coastal cities need the most protection if there was a risk of a tsunami, and on where to build buildings so that they would be most protected from these waves of destruction.

In order to test this theory, we constructed a wave generator using a glass tank and some basic materials. At one end of the tank, we had the generator itself, and at the other end we placed a glass insert at either a 90, 45, or 30 degree angle.

We tested each artificial land form twice, and discovered that while the waves for the 90 degree angle declined shortly after reaching the land, the waves for the 30 degree angles were very tall and the waves for the 45 degree slope maintained their heights fairly well after reaching the land.

From these observations, we concluded that an area with a gradual slope leading up to the land would be at the most risk.

<b>NAME(s)</b>	<b>Sally Hogan</b>	<b>PROJECT NUMBER</b>	<b>P17</b>
<b>SCHOOL</b>	<b>Christ the King, Rutland</b>	<b>GRADE</b>	<b>6</b>
<b>TEACHER</b>	<b>Mrs. Wright</b>		
<b>PROJECT TITLE</b>	<b>Does the design of a paper airplanes wings affect how it flies</b>		

### **ABSTRACT**

For my project I tested if the shape of a paper airplane's wings affected its flight. My hypothesis was that the airplane with the largest and longest wing span would be the one that would fly the farthest and would be the most consistent of the five different airplanes that I tested. I decided to do this project because my dad taught me how to make paper airplanes and he works at GE, and they work with making the parts of planes a lot so I thought this would be a good project to do with him. It turned out that the airplane with the short and wide wings was the most consistent, and it flew the farthest and the plane that I predicted that would be the best turned out to be the worst out of all of them. I think that it did the worst because the wings didn't compliment the size of the body of the plane, so there was no balance between the two. It seemed that because the wings were oversized for the body that that was why the plane wavered and it also did a nose dive upwards and then it would fly backwards. It probably would have been the best if it were a little more balanced.

NAME(s)	<b>Brian Holloway</b>	PROJECT NUMBER	<b>P18</b>
SCHOOL	<b>Windsor High School</b>	GRADE	<b>10</b>
TEACHER	<b>Jennifer Townsend</b>		
PROJECT TITLE	<b>Insulation effectiveness</b>		

### ABSTRACT

With today's fuel prices, it is extremely important to use a little energy as possible. When using an effective insulation, it prevents heat loss in the winter and heat gain in the summer. This way, the heaters have to replace less heat and the air conditioners have to eradicate less heat. Put simply, the less energy used, the cheaper the fuel bill.

A model room was used to test and find the most effective building insulation. First, each type of insulation was cut so each could fill the walls. Second, the temperature inside the box was recorded (22 °C). This was the starting temperature for each trial. The end temperature for each trial was 10°C more (32°C). The first trials (the controls) were without any insulation. The roof was put on the box, the heat source was turned on, and the stopwatch was started. When the end temperature was reached, the stopwatch was stopped, the roof removed, and the thermometer was reset. This was repeated for accurate results. This procedure was done for each insulation. The insulation that took the least amount of time to heat the model was the most effective insulation.

The experiment clearly showed that insulation severely diminishes the amount of heat loss in a building. More over, it showed that rigid foam insulation was the most effective insulation at reducing heat loss.

The results show that builders should be using rigid foam insulation in all buildings. It is the most effective at stopping heat flow. Although rigid foam will cost the builder more, in the long run it will save the homeowner much money and will stop immense damage to the environment.

NAME(s)	<b>Winfield Holt</b>	PROJECT NUMBER	<b>B33</b>
SCHOOL	<b>South Burlington High School</b>	GRADE	<b>10</b>
TEACHER	<b>Curtis Belton</b>		
PROJECT TITLE	<b>Yeast Mutations Caused by Common Compounds</b>		

### ABSTRACT

Yeast cells, *Saccharomyces cerevisiae*, have long been used to test genetics problems; in particular, ones involving mutation in genes. Rapid reproduction and easily recognizable phenotypic expression of different genotypes makes them perfect for genetic tests. In my study I used these traits to my advantage to discover how household compounds mutate the genes of yeast. My hypothesis originally was that the first compound, hair dye, would cause mutation and that the second one, ramen noodle flavoring, would not. To test this I treated different samples of yeast with the compounds and then plated them on Petri dishes with three different types of media. I used YPD media, media without isoleucine and media without tryptophan. The yeast should be able to grow fine YPD media because it is very rich. To grow on the media without isoleucine and tryptophan however, a mutation would have to happen. A mutation would have happened as well if the yeast that grew on the YPD plate grew pink instead of yeasts normal white color. So far in my tests, all the flavoring treated cells have grown white on the YPD plates, but not at all on the other ones, meaning no mutations. The cells treated with hair dye have all died, but this is most likely due to a mistake in how the first experiment was conducted. My data support my hypotheses about which compounds are mutagens so far in my tests.

<b>NAME(s)</b>	<b>Ian Horton</b>	<b>PROJECT NUMBER</b>	<b>P19</b>
<b>SCHOOL</b>	<b>St. Francis Xavier School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Mary Ellen Varhue</b>		
<b>PROJECT TITLE</b>	<b>Sound Barriers</b>		

### ABSTRACT

The purpose of my experiment was to find out which material lets the least sound through. I tested plastic, Styrofoam, fabric, tin foil, plasterboard, cement and plywood. My hypothesis was that the harder, thicker materials would reflect the most sound. To test my hypothesis, I used a device that gives out a steady sound at a steady volume and pitch. I put it in a box with a few inches thick Styrofoam boards on the outside. I put the device on the inside, covered the opening with the different materials being tested and measured the sound with a sound meter. My hypothesis was correct because the plywood, cement and plasterboard allowed less sound through. I can conclude that hard, thick materials make the better sound barriers.

<b>NAME(s)</b>	<b>James Hughes</b>	<b>PROJECT NUMBER</b>	<b>B34</b>
<b>SCHOOL</b>	<b>Rutland High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Ann Marie Mahar</b>		
<b>PROJECT TITLE</b>	<b>Steel Corrosion the Hidden Danger</b>		

### ABSTRACT

This project examines the various methods to protect a steel structure from corrosion. Steel commonly corrodes in a chemical reaction in which a redox reaction occurs. Steel in this reaction is oxidized and loses electrons to the corrosion causing reactants such as oxygen and water or in acid which gain electrons and are reduced. Twelve different pH values were experimented with a total of five different methods to protect a steel nail from corrosion for a total of twelve mini-experiments. The chemicals being tested include muriatic acid, toilet-bowl cleaner, lemon juice, white vinegar, Coca Cola soda, paint stripper, distilled water, sea water, brake fluid, antifreeze, ammonia, Clorox bleach. Stainless steel, hot dip galvanized steel, steel with zinc anodes, steel with magnesium anodes, and steel being protected by an advanced cathodic protection rectifier we tested in each of the twelve chemicals. The steel nails were used in this experiment and were massed beforehand and after the experiment to see what loss in mass occurred due to corrosion.

I had expected that the results would be more uniform across the board for a clear winner in protection but each chemical brought its own challenges to the protection method which is a good model of what the environment a steel structure is put into can supply. An unprotected steel nail had a maximum of a 78.5 mass loss from corrosion in the muriatic acid and the cathodic protection rectifier actually gained 0.1 grams in the antifreeze solution. Although indifferences occurred in the data, I can conclude that if properly designed the cathodic protection rectifier will protect a steel structure the best followed by stainless steel, galvanized steel, steel with a magnesium anode, steel with a zinc anode, and steel with no protection will lose the most mass due to corrosion.

<b>NAME(s)</b>	<b>Edward Ingerman</b>	<b>PROJECT NUMBER</b>	<b>P20</b>
<b>SCHOOL</b>	<b>Rutland Senior High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Timothy Gilbert</b>		
<b>PROJECT TITLE</b>	<b>The Effects of Surface Roughness on Boundary Layer Separation</b>		

### ABSTRACT

My experiment was to test the effects of different surfaces on the separation of airflow around spherical objects. I wanted to show the effect that rough and dimpled surfaces had on boundary layer airflow separation. The experiment was conducted using three different types of balls, a foam golf ball, a smooth foam ball, and a ping pong ball, to represent different surface roughness, which I placed in front of a vacuum wind tunnel and ran a piece of Teflon tape over. My hypothesis was that the golf ball would have the least separation due to its rough surface, followed by the foam ball and the ping pong ball. When a ball placed in front of the wind tunnel interfered with the airflow, the Teflon Tape would go over the sphere following the path of the air. I took a series of pictures of the balls, measured the angle to the point of separation using Photoshop, and then averaged and found the standard deviation of those data points.

I found that roughness did affect the separation of airflow around the spheres. The two rough spheresÆ flows both stayed connected longer, 26.9 degrees for the golf ball and 23.9 degrees with the foam ball, than the ping pong ball at 21.2 degrees. This was due to the rough surfaces creating a turbulent layer, which weakened the pressure gradient and made separation appear at a farther point on the sphere. One result I did not expect was the spread of the data. The standard deviation of data on the golf ball was 15.0, compared to only 7.3 for the foam ball, and 6.2 for the ping pong ball. This means that the amount of turbulence created by the golf ball, due to its angular dimples, was much greater than the turbulence around the others, and that longer separation related directly to the amount of turbulence around the sphere.

<b>NAME(s)</b>	<b>Heather Jacobs</b>	<b>PROJECT NUMBER</b>	<b>S10</b>
<b>SCHOOL</b>	<b>Hinesburg Community School</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Stephanie Konowitz</b>		
<b>PROJECT TITLE</b>	<b>Identical Vs. Fraternal</b>		

### ABSTRACT

Identical twins have the exact same DNA, whereas fraternal twins share only 50% of their genetic traits, but despite this fact, does this mean that identical twins are more similar than fraternal twins? This experiment is designed to determine whether twins are actually similar or not, based on if they are identical or fraternal. The outcome of this experiment might explain why twins do not always dress, act or portray themselves the same way because of their true individuality. For the experiment, 6 pairs of twins were gathered, 3 pairs of identical and 3 pairs of fraternal. I then gave three tests to all twins that were the same tests among all the pairs of twins. When the tests were complete, I evaluated the results to determine whether the tests were similar, or quite different comparing each pair of twins. The results showed that twins are not similar through the tests, but may in fact be similar in other circumstances such as what they are thinking of. From this, I can conclude that one possible reason that twins do not show their similarity with each other to others is because they still have their own individuality and want to show it through the way they express themselves and portray themselves to the world.

<b>NAME(s)</b>	<b>Stephanie Jeffer</b>	<b>PROJECT NUMBER</b>	<b>B35</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>The Learning Copacity of Fish</b>		

### ABSTRACT

A fish's brain is one of the simplest in the animal kingdom, along with the brains of amphibians and reptiles. In their natural environment they do not need an extensive amount of memory other than knowing the basics of how to survive. Over the past two months I have been testing two types of fish to see if it is possible for them to remember how to find food. Before I started my testing, I predicted that the fish would not be able to show any improvement after a month of the experiment. I designed this experiment to determine if fish have the learning capacity to find food through a relatively simple maze. After one month of testing the experimental group in this maze, I will analyze the data of how long it took each type of fish, zebra danios or cherry barbs, to get to the food as well as their behavior in the maze tank. After the one-month testing period, the control group who were getting normal feedings will be tested in the maze tank for a week along with the experimental group. The results of the experiment will be found by comparing the times of the experimental and control groups of fish. I expect that the results will show that there is not much difference between the average experimental fish and the average control fish's times. If the times are all similar, then I can conclude that the fish did not learn from the experiment, but if the times of the experimental group are significantly faster, then I can conclude that they did learn how to locate their food.

<b>NAME(s)</b>	<b>Emily Jonynas</b>	<b>PROJECT NUMBER</b>	<b>C09</b>
<b>SCHOOL</b>	<b>Green Mountain Union Middle/High School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Mr Garvin</b>		
<b>PROJECT TITLE</b>	<b>H2Oil - Keeping the Ocean Clean</b>		

### ABSTRACT

Oil spills are very threatening to ocean wildlife, and when boats have oil spills, actions have to be taken as quickly as possible to prevent damage. That is why I tested to see which material out of wool, denim, silk, cotton, and cotton balls, would absorb the most motor oil resting on water. My hypothesis was that cotton balls would absorb the most oil. To test this, I poured water and oil together into a container, and then put strips of each material into different coffee filters. One by one, I placed the coffee filters and materials into the container. After one minute, I measured how much oil had been absorbed. I found out that my hypothesis was correct, and that cotton balls did absorb the most oil. This could be useful in dealing with oil spills on a large scale.

<b>NAME(s)</b>	<b>Liam Kelleher</b>	<b>PROJECT NUMBER</b>	<b>P21</b>
<b>SCHOOL</b>	<b>Manchester Elementary Middle School</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Alexandera Rella</b>		
<b>PROJECT TITLE</b>	<b>Steam Power</b>		

### ABSTRACT

#### Abstract

The purpose of this project was to see which type of steam-powered boat will reach the end of my bathtub first. In my hypothesis I predicted that the underwater steam-powered boat would win the first two races with the above-water steam-powered boat close behind and the last race the above-water steam-powered boat would win.

The above-water steam-powered boat needs a piece of wood shaped as a pentagon (which is meant for the base), two candles (meant for a heat source), a metal cigar tube (to hold the hot water/steam), and two pieces of 18-inch wire (to hold the metal cigar tube above the candles). The underwater steam-powered boat needs a two-liter cut-in-half bottle (for the base of the boat), one small candle (for a heat source), and a two-foot piece of soft copper tubing (to hold the hot water/steam). In the experiment differently make sure that you light the candles as close as you can to at the same time. Also make sure that you fill the bathtub with luke warm water.

I discovered that the underwater steam-powered boat made it to the end of the bathtub the first and the third races and on the second race it didn't move at all. For the races that the underwater steam-powered boat did make it to the end of the bathtub, the times it took to get to the end were 22 minutes and 30 seconds on the first race and 36 minute and 40 seconds on the third race. The above-water steam-powered boat didn't move at all in all three of the races. Overall, this experiment was fun and interesting; and it shows people all around the world that steam power is a lot more efficient than you might think.

<b>NAME(s)</b>	<b>Thomas Keller</b>	<b>PROJECT NUMBER</b>	<b>P22</b>
<b>SCHOOL</b>	<b>Hinesburg Community School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Stephanie Konowitz</b>		
<b>PROJECT TITLE</b>	<b>Coils and Capacitors</b>		

### ABSTRACT

A coil gun simply put; is an electromagnet put around a barrel that pulls an object to its center and shuts off before pulling it back again. Since the object loses very little momentum, it continues and shoots out of the end of the tube. What separates a coil gun (also known as a Gauss gun) from a regular firearm is that it is not confined by the laws of combustion, so it has many more uses than simply a weapon. It keeps variables very consistent in materials testing (since there is no chance for incomplete combustion) and has a potential in launching aircraft into low-earth orbit. Keeping these things in mind, I created this experiment to determine which amount of coil windings would be able to propel a nail the furthest at the same voltage and capacitance.

I made four different coils starting at 100 windings and then increasing the number by 100 for each consecutive gun, but used the same amount of voltage and capacitance for each. I used each coil in turn to fire a projectile up a tube on a slant 6 times. I then measured the distances that each gun fired the nail after each shot.

The coil with the most windings shot the nail the furthest. The distances then went down consecutively as the amount of windings went down. I concluded from these results that since more windings mean more inductance, or a greater ability to convert electricity to magnetic force, that more windings can pull a nail with greater force and project it a farther distance. So therefore, if you are trying to achieve the most firepower for a coil or Gauss gun, try to use the largest reasonable wire.

<b>NAME(s)</b>	<b>Adrian Kelly</b>	<b>PROJECT NUMBER</b>	<b>P23</b>
<b>SCHOOL</b>	Renaissance School, Shelburne, VT	<b>GRADE</b>	<b>6</b>
<b>TEACHER</b>	Eve R. S. Dubois		
<b>PROJECT TITLE</b>	<b>Harnessing High Altitude Wind</b>		

### ABSTRACT

The purpose of my science fair project was to figure out, first, if you could harness some of the higher altitude winds, and then to find out exactly how much more powerful the higher altitude winds are, so that you can see if it will pay off to fly a kite. I also wanted to see if a kite could generate electricity.

My hypothesis is that the higher altitude winds will be powerful enough to overcome the energy needed to keep a kite flying, and that it is possible to create electricity. This is because the winds at higher altitudes are much stronger.

I made a rotor kite with meat trays and paper plates. Then, I flew the kite with no generator and no wires, just to make sure it flew. It didn't. I attached another kite to lift it up, and then I put all the wires and the generator on, and it flew up, got tangled, broke, and crashed into the ground. Right before this happened, I was able to get some electricity out of it. I am now working on lightening it and I am using leverage to counterbalance the generator. That way, I can use less weight while still keeping it balanced.

<b>NAME(s)</b>	<b>Lindsey Kent</b>	<b>PROJECT NUMBER</b>	<b>G05</b>
<b>SCHOOL</b>	Mill River Union High School	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	Mrs. Raiford		
<b>PROJECT TITLE</b>	<b>Plants and Gravity</b>		

### ABSTRACT

Will plants grow at different angles? if so, what direction will they grow in? Those were the questions to the experiment that will be answered. The hypothesis was that if a plant is placed sideways, then the plant will start to grow upright. The same will happen to a plant that is upside down. As long as the plants have light and water they will grow and gravity stimulates positive and negative gravitropic responses which cause the roots of the plant to grow down and the shoot of the plant to grow up. The control plant of the experiment was the plant that stood upright. The independent variable was the position of the plants. The dependent variable was the growth and health of the plants. The materials used in this experiment were planters, plants, string, water, 2 hooks, and a measuring tape, to measure the heights of the plants over 2.5 week time periods. A drill was used to put holes into the planter whose plant would be upside down, and a utility knife was used to cut out the hole in the side of the planter whose plant would be sideways. These holes were cut so that it would be easier to water the plants. The plants were watered every 3 days and the data was taken every week and a half. The plants gradually grew and started to bend upwards towards the light. The upside down plant didn't get as much light from the sun as the other two so it was replaced two-thirds into the project, it started to change faster after it was moved but its results still aren't as pronounced as the sideways plant. But over all the project did work and my predictions were correct. The plants did start to change course and grow upwards. If the amount of time was prolonged, it would have gotten to the point of both plants would have turned completely so their stems were facing completely straight up.

NAME(s) **ISKANDAR KHAN** PROJECT NUMBER **P24**  
SCHOOL **MATER CHRISTI SCHOOL** GRADE **7**  
TEACHER **Michelle Donlon**  
PROJECT TITLE **FORCES THAT MOVE US!**

### ABSTRACT

How do lateral, forward forces and weight affect the direction and acceleration of moving objects? If the weight and position of a propeller fan powering a skateboard changes, then the direction and acceleration of the moving skateboard should be affected.

Isaac Newton's Laws of Motion explain the rules of motion and the forces that affect motion. These laws explain the mechanics of modern vehicles used in our daily lives, like boats, rockets, or airplanes. To understand the mechanics of motion, one needs to understand the relationship between forces, acceleration, energy, and mass. To test the hypothesis, a propeller engine was mounted onto a swiveling platform on top of a new skateboard. The swiveling platform allowed the propeller to be positioned at different angles marked on the skateboard. For each angled position (0, 45, 90, 135, and 180 degrees) of the propeller, the skateboard was timed while it traveled 130 centimeters with 0lb, 1lb, and 3lbs of additional weight. Each test was repeated 3 times for accuracy.

The skateboard's movement was observed. Velocity, acceleration, and force were calculated for each test. With the propeller at 90 degrees, the skateboard moved the fastest and in a straight line. Angling the propeller caused it to move slower and at an angle. Adding weights gave it more momentum, but slowed it down further.

All three Laws of Motion were observed. The propeller fan was the unbalanced force exerted on the skateboard (first law). The skateboard moved based on the interaction of its mass and the thrust force produced by the fan (second law). Its motion was equal and opposite to the thrust produced (third law).

Changing the position of the propeller and weight on the skateboard changed the direction and acceleration of the skateboard, which is consistent with Newton's laws.

NAME(s) **Colin Kimball** PROJECT NUMBER **C10**  
SCHOOL **Hinesburg Community School** GRADE **8**  
TEACHER **Stephanie Konowitz**  
PROJECT TITLE **Rapid Rusting**

### ABSTRACT

Rust, or oxidization is a chemical reaction caused when Iron and oxygen are together with moisture from liquids or from the air. Rust is a very slow but powerful chemical reaction. Given enough time, rust will cover the entire iron surface and the object will disintegrate. Water is usually the most common liquid people think of to cause oxidization. However, most liquids can cause this chemical reaction. My experiment's purpose was to find out whether different liquids can affect metals rusting speed.

I placed 2 inch by 1 inch strips of sheet metal into 1 and a half cups of the given liquid. I used water, salt water, coke, bleach, and orange juice. There was 1 strip per cup, and 5 cups per liquid. After 24 hours, I removed all of the strips of metal and placed them on cookie racks, with five on each rack. Then I recorded data every 24 hours.

After 30 days of rusting, bleach rusted the most in the given time, followed by salt water, then orange juice, coke, and finally water as the slowest. Bleach had covered an average of 95 percent out of the five strips treated by the bleach. I think that this happened because bleach is very acidic, and was able to "eat" through the metal easier than water. This taught me that though water is the most common cause of oxidization, it is also the slowest, compared to other liquids.

NAME(s)	<u>David Kraus</u>	PROJECT NUMBER	<u>P25</u>
SCHOOL	<u>Rutland High School</u>	GRADE	<u>11</u>
TEACHER	<u>Tim Gilbert</u>		
PROJECT TITLE	<u>Bullet Penetration with different types of guns</u>		

### ABSTRACT

○The purpose of this experiment is to figure out what kind of gun penetrates paper the deepest between a 308, 7mm-08, 30-06, 30-30, 22, 280, 300, and a 12-gauge shotgun with a slug. To be consistent and to measure accurately, I will use all 150-grain bullets with semi-jacketed tips and the same kind of computer paper pressed together.

○If I shoot eight different kinds of guns at computer paper, then the highest-powered gun with smallest bullet will penetrate the paper the deepest. Therefore, out of these eight guns the Winchester 300 should penetrate the deepest and the slug in the 12-gauge will penetrate the least amount of paper.

○The first step I took was to decide which guns I would like to use and acquired them along with two bullets for each gun. Next, I built a stand to hold the paper steady while it was being shot at. When I had it completed and was ready to test my experiment I brought it to a safe place to shoot and I set my stand up. Here, I set the stand, with the paper in it, 25 yards away from the platform where I would shoot. I then shot each gun one shot at a time and changed the paper every shot so I could keep accurate results and not ruin the integrity of the paper. I then counted how many pages each bullet went through and how many pages the bullets impacted.

NAME(s)	<u>Emily Kulig</u>	PROJECT NUMBER	<u>B36</u>
SCHOOL	<u>Rutland Senior High School</u>	GRADE	<u>11</u>
TEACHER	<u>Timothy Gilbert</u>		
PROJECT TITLE	<u>Little Miss Muffet and Her Curds</u>		

### ABSTRACT

Purpose: To determine which milk will produce the most curds when vinegar is added, and whether the pH of the milks has any effect.

Hypothesis: I believe that the whole milk will weigh the most when the vinegar is added and also in the control. I also think that the pH of the milks in the control will stay the same.

Procedure: First test the pH of each milk and the vinegar. Record the data. Put 1 cup of one type of milk in a two separate pans. Both pans should be on an equal low to medium heat. Then bring one of the pans to a boil and the other to a stable 160 - 170 degrees Fahrenheit. Stir both pans occasionally. Once one of the pans is at 160-170 degrees F., quickly add 1 teaspoon of vinegar. Stir and then take off the heat. Once the other pan has reached its boil, stir it, and take it off the heat. Take the pH of both milks and record the data. Strain each milk and put into separate, marked tubeware containers.

Repeat the process for the other types of milk. Finally, grab a scale and with an empty container with a bit of tape on it, zero the scale with the container. Then scale each of the milks and record.

Conclusion: The whole milk did produce the heaviest clumps in both the control and varied experiments. But the pH did change in the control slightly.

<b>NAME(s)</b>	<b>Sarah Lange, Sarah Fiorillo</b>	<b>PROJECT NUMBER</b>	<b>GP08</b>
<b>SCHOOL</b>	<b>Brattleboro Union High School</b>	<b>GRADE</b>	<b>12</b>
<b>TEACHER</b>	<b>Michele Hood</b>		
<b>PROJECT TITLE</b>	<b>Swimmer's Itch in Local Bodies of Water</b>		

### ABSTRACT

Our goal in this project was to examine the presence of the cercariae parasite in local bodies of water. This parasite is the cause of cercarial dermatitis, which is also known as swimmer's itch and duck itch. The parasite is found in the immature larval forms of schistosomes, which are parasitic flatworms. They are released by infected snails found in many different types of water, especially in still bodies of water. The parasite is then released into the water and travels to its host, namely ducks and other similar birds. Humans contract cercarial dermatitis when the parasite penetrates the human's skin instead of traveling to its usual duck host. Therefore, a high quantity of both ducks and snails in a body of water can be correlated to the body of water containing the parasite. In our project, we compared the prevalence of the parasite in the West River with other local bodies of water. We hoped to test snails, snail feces, duck feces, and the water for the parasite in the West River and the other local bodies of water to determine its prevalence in each body, but we experienced great difficulties and had to resort to other methodologies including trapping snails, attempting to infect chicken liver with the parasites, and buying snails and infecting them with the parasite. We sought to determine if the parasite was present in each body of water, which body contained the highest quantity of it, why it is surviving in moving bodies of water, and how to rid or decrease the amount of the parasite in the waters. However, with our hardships we were unable to derive conclusive evidence, but we still able to draw parallels between the prevalence of the parasite and flow rate, determine which bodies were infected and infer which bodies contained the highest quantity of the cercariae parasite.

<b>NAME(s)</b>	<b>Ariel Langevin</b>	<b>PROJECT NUMBER</b>	<b>B37</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>Fruit Flies Mutations</b>		

### ABSTRACT

All organisms can be subject to recessive and dominant mutations, but for the recessive mutations to show more often, they need to be inbred, so you can see the characteristics. To learn more about specific recessive mutations I inbred fruit flies, as well as looked for the mutations that the category of flies - which is wild type - had. At home I set up vials for particular breeding, with one control group in a larger container at first and the next generation in randomly selected pairs, similar to the experimental group. After one purely inbred generation - two generations overall - I studied the offspring in both the control and experimental groups to see the ratio of amount of mutations compared and other differences (more below). I also hypothesized that the mutations corresponding to the flies' wings would be more prominent. I will also analyze other factors, for example eye color, body structure and diseases and how they are different. I still expect my hypothesis to prove true.

NAME(s)	<b>Meghan Lavoie</b>	PROJECT NUMBER	<b>C11</b>
SCHOOL	<b>Mater Christi School</b>	GRADE	<b>8</b>
TEACHER	<b>Michelle Donlon</b>		
PROJECT TITLE	<b>Jell-O or Gel-No?</b>		

### ABSTRACT

The purpose of the science fair project is to determine which fruit contains the highest amount of protein-digesting enzymes, bromelain and papain. These enzymes, classified as proteolytic, conduct the process of proteolysis in which protein catabolism occurs by hydrolysis of the peptide bonds that link amino acids together in the polypeptide chain. Alternatively stated, they break protein down using a chemical reaction to split a specific bond that is crucial in linking acids together to create a protein-based chain that is a foundation for matter. After research, it was discovered this process is easily visible in gelatin because if these certain enzymes are incorporated in it, they will prevent it from solidifying. Therefore, the setting of gelatin was made the sole determiner of the enzyme levels in eight different fruits. A hypothesis was made based on prior research stating that a high concentration of bromelain existed throughout all areas of a pineapple: If various types of fruit are tested in gelatin, then pineapple will cause the least amount to solidify; it contains the most enzymes. To begin the experimenting procedure, all materials were gathered and fruits were sliced and weighed out to 56 grams each. Next, the gelatin mixture was prepared according to the instructions on the box, a half cup of liquid was poured into each bowl, and the plain gelatin was refrigerated for an hour before the 56 grams of fruit were stirred into their respective bowls. They were refrigerated for 16 additional hours and observations were taken every four. After the entire procedure was completed twice and results were averaged, it was concluded the hypothesis was correct; pineapple contains the highest amount of protein-digesting enzymes as demonstrated by the least amount of gelatin solidifying, 25 percent, when pineapple (and its abundant content of proteolytic enzymes) were incorporated.

NAME(s)	<b>Braelynn Leppert-Hill</b>	PROJECT NUMBER	<b>B38</b>
SCHOOL	<b>St. Francis Xavier School</b>	GRADE	<b>8</b>
TEACHER	<b>Mary Ellen Varhue</b>		
PROJECT TITLE	<b>A Hair's Difference</b>		

### ABSTRACT

The purpose of my project was to see which natural hair lightener works best on which color hair. The hair colors I tested were red, black, brown, light brown, and blonde. I wanted to test five natural hair lighteners on un-dyed hair to see which ones will work. I believed that the Chamomile Spray recipe would work the best with the lightening in general. I think that it will excel at the blond hair, but will also work for the dark hairs. It might not work for red hair, because red hair needs a high pH level to lighten to any degree. The control variable was time; the manipulative variables were the ingredients and the hair color. The responding variable is the degree of lightening. I measured the responding variable by shade differences. I did this by using a shade chart online. For my procedure, I first gathered my ingredients. Next I mixed the first recipe, and dipped the hair in it. I continued doing this for the five recipes, until I had used them all. Then I tested some of the base ingredients. My findings were that of the five most popular natural hair-lightening recipes, Vitamin C and Lemon juice with harsh Suave shampoo worked the best. The hair was 2-3 shades lighter, and multiple applications of this could show further results. This disproved my hypothesis that the Chamomile Spray would work the best. If I were to do this again I would test more recipes.

NAME(s)	<u>Anna Lind</u>	PROJECT NUMBER	<u>C12</u>
SCHOOL	<u>Mill River Union High School</u>	GRADE	<u>10</u>
TEACHER	<u>Mrs. Carolyn Raiford</u>		
PROJECT TITLE	<u>Liqued Sunshine: Putting OJ to the Test</u>		

### ABSTRACT

○The purpose of my science project was to test if orange juice flowed differently at varying temperatures. It is believed that the orange juice with the highest temperature would flow the fastest, and the coldest juice would be the slowest. The independent variable in my project was the orange juice I tested. The dependent variable was the flow of the juice at 90 and 0 degrees Celsius. The control of the project was the flow of the juice at 45 degrees Celsius. To test this one must have three orange juices with a variety of temperatures. Boil 50 ml of orange juice using a microwave. Once in the burette, follow the time of how long it takes for the juice to flow out. Repeating the previous step with juice samples that are 0 degrees Celsius and 45 degrees Celsius, helps compare the contrast of results. The results that were found in this experiment were that the boiling or 90 degrees Celsius juice had an average flow of 9.49 seconds for 5 ml to flow. The 45 degree Celsius had an average flow of 8.05 seconds for flowing through the burette. The average flow of the 0 degree Celsius juice was 13.54 seconds. It can be concluded that the 45 degree juice has the fastest rate of flow. A possible source of error is the accuracy of the stopwatch. Why is this important you might ask, well I think that juice producing companies would benefit from using the conclusions above. When filling juice cartons at a factory, they could produce more cartons and have a higher profit, if they fill the cartons at the highest speed.

NAME(s)	<u>Forrest Lisle</u>	PROJECT NUMBER	<u>B23</u>
SCHOOL	<u>Green Mountain Union Middle/High School</u>	GRADE	<u>8</u>
TEACHER	<u>Mr Garvin</u>		
PROJECT TITLE	<u>Shedding Light on Mold</u>		

### ABSTRACT

My topic was the effects of various types of light (black, florescent, and incandescent) on the mortality of mold. I did numerous tests to see which type of light kills mold most effectively. My hypothesis was that black light would kill mold or at least stunt it's growth, and that florescent and incandescent light would have no effect. What I did to carry out my experiment is implanted same-sized pieces of moldy bread into fresh bread. Then I exposed the moldy bread to a designated light for one hour a day, for five days. My results were just as I had predicted, the incandescent, florescent, and control groups of mold flourished while the black light sample had much less growth. My data clearly shows me that black light most effectively kills or stunts mold growth, which is the information I was searching for.

NAME(s)	<u>Michael Loughran</u>	PROJECT NUMBER	<u>G06</u>
SCHOOL	<u>Mater Christi</u>	GRADE	<u>7</u>
TEACHER	<u>Michelle Donlon</u>		
PROJECT TITLE	<u>Nails For Breakfast</u>		

### ABSTRACT

The question was would there be more iron in the bottom of the cereal box than the top. The hypothesis was, if the cereal box was divided into ten servings, then there would be more iron in the bottom serving. One of the things that needed to be researched was how to take the iron out of the cereal. Another thing to research was how much iron is supposed to be in each serving. The set up was to separate the box into ten <sup>1</sup>/<sub>10</sub> cup servings. Then pour cereal and two cups of hot water into the blender and blend them up. Then put the cereal in a baggy and repeat with all ten servings. The next step was to take the iron out by dropping a strong magnet into the bag. Next take the magnet out, rinse with clear water to remove the cereal. Now rub the iron onto a clear plastic tape and then weigh it on a scale. Now there are ten cards with the iron particles to be weighted. Using a scale that weighs in grains, weight each card and record data. Then use the computer to convert from grains to milligrams. The project showed that there was more iron per serving than was stated on the package. The box had a varied concentration of iron. Since the cereal was poured out of the box, this may have effected the distribution of the iron.

NAME(s)	<u>Emily Louras</u>	PROJECT NUMBER	<u>B39</u>
SCHOOL	<u>Rutland Senior High School</u>	GRADE	<u>11</u>
TEACHER	<u>Timothy Gilbert</u>		
PROJECT TITLE	<u>Which Material Gives Off the Most Pollutants When Burned?</u>		

### ABSTRACT

Purpose: By conducting this experiment, i will determine which type of cup material will give off the most pollutants into the atmosphere, the visible particulates, not the toxins that are invisible to the naked eye.

Hypothesis: I believe that after burning all of the cups separately, the plastic cup will give off the most pollutants. The plastic cup has so many components to it that there are barely any natural fibers in it. The paper cup has the most natural components so it should have the least pollutants, and the Styrofoam cup is a type of plastic but i believe it is closer to biodegradable than plastic is.

Procedure: I took one plastic, one paper and one Styrofoam cup and placed them (one at a time) into the bottom of a coffee can. I then covered one of the two opened ends of a small tin can with a coffee filter and secured it with a rubber band. Then i ignited the cup and placed a metal strainer over the top of the coffee can. On top of the strainer I placed the tin can with the filter to catch the smoke. I timed how long the cup burned before snuffing itself out and then removed the filter from the tin can afterwards. I recorded the time of the burning and the appearance of the filter to examine the pollutants that had been picked up.

Conclusion: After burning all three cups, to my surprise, the paper cup left the most pollutants on the filter. The paper cup left an almost oily ash residue on the filter. I believe that the time it took to burn down affected this outcome because it took the paper cup six minutes longer to burn down than the other cups. The length of time it took allowed more smoke and pollutants to be collected by the filter. With the plastic and Styrofoam cups, they burned down rather quickly, giving off less smoke to be caught in the filter.

<b>NAME(s)</b>	<b>Claire Maass</b>	<b>PROJECT NUMBER</b>	<b>S11</b>
<b>SCHOOL</b>	<b>Rutland High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Timothy Gilbert</b>		
<b>PROJECT TITLE</b>	<b>Feel the Beat: The Affect of Music on Heart Rate</b>		

### ABSTRACT

As a music connoisseur, I have long striven to make connections between the songs that I fervently listen to and the world in which I live. When the opportunity arose to demonstrate to my fellow peers, as well as various adult members of the community, that music does indeed have scientific significance in daily life, I set out to conduct an experiment in which I could support the hypothesis that the tempo of music directly correlates with heart rate. According to this hypothesis, a song with a fast, distinct tempo will cause the heart rate to increase, while a slower, more smooth song will cause it to decrease.

In this experiment, I tested twenty-five persons under similar conditions. Each subject underwent four identical stages of the test. My initial step was to measure the subject's heart rate in beats per minute, also connoted as bpm. I then had him or her measure his/her heart rate a) after a minute of being exposed to no music, b) after a minute of listening to 'Brahm's Lullaby,' and c) after a minute of listening to the fast-paced song called 'Bombs Over Baghdad' by Outkast.

Upon analyzing the results of my experiment, I came to the conclusion that my data did support my hypothesis, for an overwhelming percentage of the participants displayed a significant increase in heart rate after listening to the faster song, and a decrease in heart rate after being exposed to a slower song. Naturally, the subjects' heart rates were not entirely uniform after a minute of no music in comparison to the initial heart rate, but the data revealed that any such fluctuations were minor and of no consequence when compared to the heart rates after being exposed to music.

<b>NAME(s)</b>	<b>Emily Martin</b>	<b>PROJECT NUMBER</b>	<b>B40</b>
<b>SCHOOL</b>	<b>Northfield High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Cynthia Tomczyk</b>		
<b>PROJECT TITLE</b>	<b>The Effect of Excessive Amounts of Nitrogen on the Activity Levels of Mice</b>		

### ABSTRACT

Unlike temperature and dissolved oxygen, the existence of nitrates usually does not have a direct effect on aquatic insects or fish. Excessive amount of nitrate can lead to conditions such as methemoglobin in the blood which accounts for the decrease in oxygen levels. Would excessive amounts of nitric foods affect the activity level of mice also? One group of adult mice was being fed low levels of nitrogen (12 percent). The second group (of mice) was consuming normal levels of nitrogen (22.5 percent). The last group (of mice) would be fed excessive amounts of nitrate. They are eating the same feed as average nitrogen levels, with an addition of 10.00 grams of lettuce. I chose lettuce because it's one of the leading producers of nitrate, which contains nitrogen. I started this experiment with taking the average initial activity level of each mouse. Every week, the mice endured thirty minutes on the exercise wheel. As the mice with 12 and 22.5 percent nitrogen and a higher nitrate concentration were tested, the percent change in activity levels were -2.22, -3.31 and -5.17. The results collected were slight, so I modified this experiment by doubling the amount of lettuce consumed by the mice eating the high nitrogen diet. The higher nitrogen levels decreased the activity level of these mice to -7.59 percent change. While testing younger mice, the 12 and 22.5 percent nitrogen acquired 1.77 and -3.72 percent change in activity levels. The higher nitrogen levels of younger mice acquired a -13.19 percent change in activity levels. A trend concluded from this data was as nitrogen increases, the activity level of mice decreases. As the amount of nitrogen increases, oxygen is unable to be transported throughout the blood. The oxygen count decreases and therefore their activity levels decreases.

NAME(s)	<u>Connor Mawe</u>	PROJECT NUMBER	<u>B41</u>
SCHOOL	<u>Hinesburg Community School</u>	GRADE	<u>8</u>
TEACHER	<u>Stephanie Konowitz</u>		
PROJECT TITLE	<u>A Cheesy Dilemma</u>		

### ABSTRACT

Bacteria have plagued our lives for thousands of years, and we've tried to reduce bacterial growth in our food. I wondered how using cheese with less or more water would affect bacterial growth, given that bacteria, like all living things, need water to live. I used two ages of cheddar, 6 month old and 2 year old, and I added distilled water to another sample of 6 month old cheese to get a wider spectrum of dilutions. I then added bacteria to the 3 cheese samples. I took 11g of cheese from each sample on day one, day 7, and day 14, mixed with distilled water and a buffer to turn the S. aureus colonies black, to make them easier to count. I placed the cheese/bacteria mixes onto agar to grow and incubated them for 48 hours. I then counted the colonies and found that the mix that grew the most colonies was the 6 month old cheese with added water. The other two samples grew fewer cell colonies but the 6 month old non-water-added cheese grew more bacteria than the 2 year sample. I deduced that 2 year old cheddar cheese, which supported minimal bacteria growth, would have a longer shelf life than the other cheeses tested.

NAME(s)	<u>Kelly McCarroll</u>	PROJECT NUMBER	<u>C13</u>
SCHOOL	<u>Rutland High School</u>	GRADE	<u>11</u>
TEACHER	<u>Susan Ponto</u>		
PROJECT TITLE	<u>Chromatography</u>		

### ABSTRACT

○Chromatography is a method commonly used for analyzing complex mixtures by separating them into the chemicals from which they are made. Chromatography is used to separate and identify all sorts of substances. In this experiment, this method was used to analyze the different shades of eyeliner. The purpose was to see what colors were used to create those shades of makeup. It was hypothesized that the black shade of eyeliner would be made up of the most colors.

○

○A set of colors from two different brands of eyeliner was purchased. Both were tested by placing a dot of each shade on a strip of chromatography paper and placing each piece of paper into a separate test tube containing one of the solvents. The eyeliners from the first brand, Palladio, proved to have a stronger polarity than the solvents that were available for student use. When the experiment was repeated using the eyeliner from the second brand called HiP it was found that those, too, were stronger than the solvents. The first set of eyeliners was not water soluble; however, the second set was water soluble. Four solvents had been tested: deionized water, ethanol 60%, acetone, and turpentine. Respectively, each solvent had a stronger polarity and had a better chance of affecting the eyeliner.

○

○Unfortunately, none of the solvents could carry the makeup molecules up the chromatography paper. The failure of this experiment led to the summary that it would be necessary to use stronger solvents if eyeliner was going to be tested by chromatography. To find a successful solvent, the ingredients of eyeliner would need to be researched, along with its behavior, polarity, and other chemical characteristics. Even though no data was obtained this experiment does help narrow down which solvents can not be used. The reason other solvents were not tested was due to safety factors involved with using those chemicals.

NAME(s)	<u>Alicia McCormick</u>	PROJECT NUMBER	<u>C14</u>
SCHOOL	<u>St. Francis Xavier School</u>	GRADE	<u>7</u>
TEACHER	<u>Mary Ellen Varhue</u>		
PROJECT TITLE	<u>Rusted Bridges Falling Down</u>		

### ABSTRACT

The purpose of my experiment was to find out if the concentration of salt affects how fast iron rusts. I also wanted to find out how important the type of paint was to how slowly the iron would rust. I hypothesized that the nails in a more concentrated salt solution would rust the fastest. I also hypothesized that spray paint would provide the most protection against rust. To keep this experiment as fair as possible, I only changed one thing in each variation of the experiment. I either changed the type of paint or the wear and tear each nail was exposed to.

In my procedure I painted 24 nails out of 27. The three extra nails that were unpainted were my control group. I put all the nails through extreme temperature changes in attempt to wear the nails. I then sanded some of them to provide more wear and tear. I put all 27 nails into water concentrated with different amounts of salt. I let the nails sit in the water for 10 days.

Each day I wrote down my observations and gave them a rating. I had predetermined the rating system. After rating and looking at the nails I proved my hypothesis to be wrong. The salt seemed to preserve the nail, rather than rust it faster, as I had believed. The spray paint theory was also proven wrong. It had one of the highest corrosion rates.

If I were to do this experiment again, I would improve it by finding better ways to rate the rust damage to make it more consistent. I would also let the nails rust for a longer period of time, such as a month. If I wanted to expand on this project I would investigate more on the effect of the salt.

NAME(s)	<u>Nicolas McKelvie</u>	PROJECT NUMBER	<u>S12</u>
SCHOOL	<u>Rutland High School</u>	GRADE	<u>11</u>
TEACHER	<u>Tim Gilbert</u>		
PROJECT TITLE	<u>Do Musicians Have Better Pitch?</u>		

### ABSTRACT

Using a wide pool of teenagers I will administer a test to determine whether musical experience has any noticeable impact on the ability of the subject to sing a note in tune. I believe I can make an accurate test by controlling virtually all the factors except for musical experience, and thereby produce conclusive results. I predict that if the pitch is tested of a variety of people with different musical backgrounds, then the people with more musical experience will have significantly better pitch than those with less experience.

In order to accomplish this goal I gathered a pool of sixty-four subjects over the course of about three months. I played them a three-note chord and allowed them to practice singing it. I then had them sing the bottom note of the chord. I then determined whether the subject was in tune or not using a chromatic tuner. After, I recorded whether the subject was on pitch, sharp, or flat on this note. Also, if they were sharp or flat, I noted down how much.

Out of the group of the sixty-four subjects, three non-musicians managed to sing the pitch of the bottom note of the chord correctly. However, eight musicians, seven of them chorus members, managed to do the same. The best pitch was quite evidently in the chorus, where the average pitch was 5.6 cents away from being in tune. For band members, the average distance was 18.8 cents from being on, and 11.0 cents away for string players. Overall, musicians were only 9.6 cents away from being in tune, whereas non-musicians were at an average of 13.5 cents. I believe this confirms that pitch can be developed over time, and that therefore musicians have better pitch overall.

<b>NAME(s)</b>	<b>Katie McNally</b>	<b>PROJECT NUMBER</b>	<b>P26</b>
<b>SCHOOL</b>	Green Mountain Union Middle/High School	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	Mr Garvin		
<b>PROJECT TITLE</b>	<b>Catching Rays</b>		

### ABSTRACT

My topic is on solar power and if the angle of light affects the efficiency of a solar panel. I was trying to see if the angle of a solar panel according to your light source would make the solar panel anymore or less efficient. I decided to use a tripod with a solar panel attached to it, and a lamp to see if the angle would affect the efficiency. I used three different light bulbs and from 0-90-degrees and measured the current coming from the solar panel. I found out that the angle of the solar panel that is perpendicular to the light source works the best. This means that the angle of the solar panel does matter.

<b>NAME(s)</b>	<b>Chelsea Melendy</b>	<b>PROJECT NUMBER</b>	<b>B42</b>
<b>SCHOOL</b>	Windsor High School	<b>GRADE</b>	<b>12</b>
<b>TEACHER</b>	Jennifer Townsend		
<b>PROJECT TITLE</b>	<b>The Physiological Effects of MSG on Mice</b>		

### ABSTRACT

The purpose of this project was to determine if the introduction of MSG (monosodium glutamate) into processed foods has contributed to the obesity epidemic in America . To determine if MSG is a factor in weight gain, I examined the physiological effects that it had on mice. I hypothesized that the mice prescribed to the diet containing MSG would gain more weight overall than the mice on the diets of just dry food and peanut butter, because MSG effects the metabolic processes in the body, and enhances the flavor of food.

The mice each resided in their own 9in x 9in x 9in wooden cage in a quiet, sunny room. Their bedding (wood shavings), food, and water bottles were changed and filled every other day. The mice were split into three groups. The first group were given an unlimited amount of dry food that was weighed. Mice can eat up to 4 grams of food per day, so any amount over 8 grams for two days was considered unlimited. The second group was given unlimited dry food and 5 grams of natural peanut butter. The third group was given unlimited dry food, and 5 grams of peanut butter mixed homogenously with 0.5 grams of MSG. Their food was weighed before it was given to the mice, and the remaining food was weighed after two days. At the beginning of each feeding period, every two days, the mice were weighed. The cycle was then repeated. The mice were observed 5 days a week.

Mice in the MSG group gain a greater percentage of body mass than the other groups, therefore suggesting that the use of MSG in processed foods could contribute to the obesity epidemic in America. Over stimulation to the glutamate receptors in specific anatomical structures of the body, such as the arcuate nucleus of the hypothalamus and the pancreas, can be directly linked to an increase in adipose tissue.

NAME(s) **Nina Merriam** PROJECT NUMBER **S13**

SCHOOL **Main Street Middle School** GRADE **8**

TEACHER **Eli Rosenberg**

PROJECT TITLE **Do We see the Same Colors or Call Them Different Things?**

### ABSTRACT

The purpose of this project was to discover whether or not we see the same colors or if we have learned to call them different things. I predicted that we do see the same colors and that we have learned to call them different things. In order to test my hypothesis, I devised a test that would measure several important factors. These included color vision, ability to distinguish slight differences in shade, and a person's word choice when describing a color. I placed participants in a black box with a consistent light source to take the test. All of my participants were able to accurately see slight differences in the shade of a color. However, when I asked participants to label colors that were somewhere in between blue and green, I had mixed results. Some participants would call a color blue; while others would call the same color green. I am thus lead to believe that we do see the same colors, but we are calling them different things.

NAME(s) **Chelsea Montello** PROJECT NUMBER **P27**

SCHOOL **Fair Haven Union High School** GRADE **9**

TEACHER **Ben Worthing**

PROJECT TITLE **How Does Density Affect the Bounciness of Cafeteria Food?**

### ABSTRACT

The purpose of the project was to determine how density will affect how cafeteria food bouncess. Samples were collected form lunch each day, and back at the testing site, they were weighed, measured, and tested for bounciness. Food was launched at the wall and the initial landing of the bounce back was recorded along with the complete distance. In the end, density did not seem to affect the bounciness of any of the samples, but I still found out that the cafeteria food bounces unusually far.

<b>NAME(s)</b>	<b>Kylie Moore</b>	<b>PROJECT NUMBER</b>	<b>S14</b>
<b>SCHOOL</b>	<b>Christ the King School, Rutland</b>	<b>GRADE</b>	<b>6</b>
<b>TEACHER</b>	<b>Mrs. Wright</b>		
<b>PROJECT TITLE</b>	<b>What is the most successful way of quitting smoking?</b>		

**ABSTRACT**

The main question I asked for this project was what is the most successful way to quit smoking. When I started my project I had to find out the many ways there are to quit smoking. My hypothesis was that the Nicoderm Patch would be the most successful. I chose this project because I wanted to know how I could help the people that struggle with finding a successful way for them to quit. The procedure I had to take was first I needed to find four successful quitters to tell me everything they used to quit. Then I had to come up with a set of survey questions to ask them. Next I took all the information they gave me and put it all together. After interviewing the four participants I found that with will power, them each giving it a shot, only one person could do it. Also I found that the reason the Nicoderm Patch was so popular was because it gave the person wearing it the nicotine he or she needed. In the end my hypothesis was correct, the Nicoderm Patch, out of the Nicorette gum, the nicotine pills, and will power, it came to be the most successful.

<b>NAME(s)</b>	<b>Jeffrey Morgan</b>	<b>PROJECT NUMBER</b>	<b>B43</b>
<b>SCHOOL</b>	<b>Northfield High School</b>	<b>GRADE</b>	<b>12</b>
<b>TEACHER</b>	<b>Amy Urling</b>		
<b>PROJECT TITLE</b>	<b>Eradicating Japanese Knotweed û Seeking a destructive non-polluting alternative to glyphos</b>		

**ABSTRACT**

Japanese Knotweed (*Polygonum cuspidatum*) is an invasive species found in Vermont wetlands. It can have a negative ecological, economic and aesthetic impact where there are quantities of it. Currently, the approved chemical for killing Japanese Knotweed is glyphosate (Round Up). Glyphosate is mildly toxic to fish and birds and may stay in stationary water up to 12 days.

My experiment was designed to search for ways to kill Knotweed with inexpensive and biodegradable items as alternatives to glyphosate. I hypothesized that a common household item would be as effective as glyphosate. In my preliminary trial, Knotweed was submersed in each of the following solutions: saline solution, vinegar, non-polluting camp soap, and hot water and bleach. It was determined that vinegar showed the most promise for killing Knotweed.

During the primary trials, my hypothesis was refined to look at the lowest concentration of vinegar that would kill Knotweed. I added 100, 75, 50, and 25 percent concentrations of vinegar into separate bottles containing equal size pieces of Knotweed root and let them sit from two to four weeks. Additionally, one bottle contained the root segment and distilled water, serving as the control, and one bottle contained the root segment and glyphosate, as a reference for comparing cell destruction and analyzing the other solutions' effectiveness. After two and four weeks I took a segment of each sample and examined the percentage of live cells using a microscope, I then recorded the percentage of live cells by comparing to the control.

My principal findings were that all variations of concentrations eventually killed the same amount of cells after the extended period of four weeks.

My conclusion is that all levels of common household white vinegar show promise as an easily accessible, non-polluting, and inexpensive alternative to glyphosate for effectively killing Japanese Knotweed.

NAME(s) **Stephanie Morvan** PROJECT NUMBER **B44**  
SCHOOL Northfield High School GRADE 11  
TEACHER Amy Urling  
PROJECT TITLE **The Effect of Dishwasher Soap on the Growth of Radish Plants**

### ABSTRACT

In this lab I wanted to test how much detergent radish plants could live with. I mixed solutions of water and dish soap to create percents of twenty five percent, fifty percent and seventy five percent. This would act as run-off from houses. I put the twenty five percent mixture on three plants. I put the fifty percent mixture on three plants and I also put the seventy five percent mixture on three plants. I left three plants with just water, as a control. After the first week the plants with the seventy five percent solution were very brown and almost dead, but the plants with just water were growing fine. The control plants had an average increase in height of 18.75 percent. The plants with the 25 percent spray had an average increase of 2.70 percent. The plants with the 50 percent spray had an average height increase of 0 percent and the plants with the 75 percent spray had an average height decrease of 46.42 percent. A major conclusion I came to was that the detergent was not affecting the 25, and 50 percent plants very much but the plants with the 75 percent spray on them had major wilting.

NAME(s) **Weston Muench** PROJECT NUMBER **B45**  
SCHOOL Manchester Elementary Middle School GRADE 8  
TEACHER Scott Diedrich  
PROJECT TITLE **Does caffeine affect the heart rate of Daphnia magna?**

### ABSTRACT

The purpose of my project was to observe if caffeine affects Daphnia heart rates similar to humans. I chose Daphnia magna to caffeinate because I had been working with daphnia throughout or science class. I picked this project because I thought it would answer a lot of my questions about caffeine.

I started by filling five beakers with 1000 mL of spring water. Then I put approx. 10 daphnia in each of the beakers. I took caffeine tablets and grounded them into a powder. Then I put 100 mg, 75 mg, 50 mg, and 25 mg of caffeine in each of the beakers, the one with no caffeine with be the control. Over the course of the next couple of weeks I would measure the heart rate of the one Daphnia at a time from each beaker. Then I would find the mean heart rate of all the beakers.

My results showed that there was an increase of heart rate in the beakers with the Daphnia but there was no evidence that the concentration of the caffeine made any difference. The 50 mg of caffeine increase 28 bpm, 25 mg increased 8 bpm, and 100 mg increased 1 bpm, and the water in the 75 mg was filled with bacteria and killed all the Daphnia.

In conclusion caffeine does affect other living things other than humans. I know this because in the beakers with caffeine there was a mean increase of about 12 bpm. Despite a lack of evidence that increased concentrations of caffeine causes greater hear rates, I found that caffeine does cause the heart rate of the Daphnia to increase overall.

NAME(s)	<u>Sara Muguira</u>	PROJECT NUMBER	<u>B46</u>
SCHOOL	<u>Green Mountain Union Middle/High School</u>	GRADE	<u>8</u>
TEACHER	<u>Mr Garvin</u>		
PROJECT TITLE	<u>Working the Bit</u>		

### ABSTRACT

In my paper it describes the domestication of horses and who invented them. That brings me to my question: which bit works better for your horse to come together? Which makes me predict a hypothesis that the JP full cheek French link bit will make the horse's head almost touch its chest faster because it is a harsher bit? The answer to this question was found by timing in minutes how long it took the horse to come together with the max time being 5 minutes. I did this over the course of 4 days then I averaged the times and came up with a total for how long it took all of the horses. In my results I found out that the Sweet iron bit took less time rather than the JP full cheek French link. This means that my hypothesis is wrong because sometimes the harsher the bit the more time it takes for the horses to come together and the softer the bit the less time it takes for the horse to come together.

NAME(s)	<u>Jonathan Murray</u>	PROJECT NUMBER	<u>P28</u>
SCHOOL	<u>Fair Haven Union High School</u>	GRADE	<u>12</u>
TEACHER	<u>Jesse Roberts</u>		
PROJECT TITLE	<u>Wind Power</u>		

### ABSTRACT

Over the past couple of years I have done projects around aerodynamics. Aerodynamics are the properties of any object moving through a volume of air. With the new push toward renewable power sources, I looked into wind turbines. I have built many wind tunnels over the past couple of years and have tested various ideas from the overall design of wind tunnels, to the drag on balsawood gliders. My previous wind tunnels increased the velocity of the air by about 17%. I wondered if that percent would be about equal to the percent power increase that I would get if I put wind turbines in one of my wind tunnels. My hypothesis was: If I were to place three of the same wind turbines and a fourth being of my own design inside of a wind tunnel where the velocity of the air was increased by about 17%, then the power harnessed by the wind turbines in the tunnel would be about 17% more than the turbines outside of the wind tunnel. My hypothesis was proven wrong. The highest voltage I read was 3.1 volts, the highest amperage was .151 amps and my highest power was .07 watts, within the wind tunnel. Outside the wind tunnel; the highest voltage was 1.1 volts, the highest amperage was .05 amps, and the highest power was .008 watts. The percent increase from outside to inside of the wind tunnel was 1143%. My conclusion was that my power increase from putting the turbines inside the wind tunnel was 1143%, which is a lot higher than the 17% that I had originally hypothesized. The reason for this is because the wind that goes through the wind tunnel is being pulled, has no gusts, and is being compressed at the same time, while the wind outside of the wind tunnel is push toward the turbines creating a vortex, has gusts, and the air particles are farther apart.

NAME(s) Anna Nadler PROJECT NUMBER B47  
SCHOOL Rutland High School GRADE 11  
TEACHER Tim Gilbert  
PROJECT TITLE Comparing Gluten and Gluten-Free Foods

### ABSTRACT

In 1997, my big brother, little sister and I were diagnosed with Celiac Disease. After almost five years of my life following an unrestricted diet, I was limited to eating gluten-free foods. Suddenly I was able to eat many everyday foods. Since I was only four years when diagnosed, I do not clearly remember what foods with gluten taste like which led to my doing of this experiment.

With this experiment, I wanted to find out how closely my gluten-free cornflakes and chocolate cake resemble their gluten counterparts. By feeding my testers both gluten and gluten-free cornflakes and chocolate cake, they were able to try and distinguish which was which. I found corn flakes to be easier for testers to distinguish between with 2/3 of my testers being correct. They found the chocolate cake much harder as I thought it would be. Just over half were able to correctly distinguish between the two types. Many found it difficult because there are many types of chocolate cakes available everywhere.

Overall, I was able to learn that by being on a gluten-free diet, I am not missing out on too much. Some people were not even able to tell the difference between gluten and gluten-free food. In the future, I would like to find out what people think about other types of gluten and gluten-free foods and see if my results differ. For now, as long as I am healthy and on my gluten-free diet, things are perfect because my body is getting the nutrients that gluten was unable to give it.

NAME(s) Sarah Nadler PROJECT NUMBER C15  
SCHOOL Christ the King School GRADE 7  
TEACHER Mrs. Wright  
PROJECT TITLE The Fastest Way To Cool A Soda

### ABSTRACT

For my experiment, I thought the fastest way to cool a can of soda from room temperature to a reasonable drinking temperature was to submerge the can in an ice-water bath. I decided to do this project because many Americans drink soda. What I did was I tested three cans of soda per each cooling device. I used a refrigerator, freezer, ice-water bath, and ice bath. Then for about an hour you test each can in each cooling device every 10 minutes or so with a digital thermometer. Then I recorded the temperature. Then I made graphs for the cooling speed of each device. It turned out that the ice-water bath cooled the soda the fastest. I thought the ice-water bath would cool the fastest because it had the cold water plus the ice surrounding the cans.

**NAME(s)** Cody Nalbach **PROJECT NUMBER** B48  
**SCHOOL** Christ the King School **GRADE** 7  
**TEACHER** Mrs. Wright  
**PROJECT TITLE** Do animals have a paw preference

### ABSTRACT

The question is: "Can animals be lefty or righty?" My hypothesis is: "I think animals will favor one paw over the other and I also think most of them will be righties." I did this project because I wanted to see how animals think and to see if they think anything like humans. My procedure was to put a toy in front of an animal and see what paw they used to swat it. I also put a treat in a cup and checked what paw the animal used to get the treat out of the cup. I worked with friend animals and watched about 10 cats and 10 dogs and about 8 horses. My data was that, like humans, most animals prefer the right paw. I found out that some cats are both. So when it comes to hand and paw preference, humans and animals are a lot alike.

**NAME(s)** Laura Nelson **PROJECT NUMBER** B49  
**SCHOOL** South Burlington High School **GRADE** 10  
**TEACHER** Curtis Belton  
**PROJECT TITLE** The Effects of Caffeine on the Human Body

### ABSTRACT

There has always been a certain controversy on the topic of caffeine and its effects on people. Scientists know that caffeine works by acting as adenosine, a chemical in the brain. Adenosine receptors bind to it, speeding up brain activity rather than adenosine's job of slowing it down. How exactly this affects someone physically and mentally is the primary question. This experiment tests a large group of subjects to see the effects of caffeine first-hand, on jump height, heart rate, and ability to complete math facts quickly. I will also investigate whether the fact that someone thinks they are drinking caffeine will affect them. I will split my subjects into three groups: caffeine drinkers, and two groups that will not receive caffeine, one of which thinks they are and the other that knows they aren't. The aware non-drinkers are my control, and the other two groups are my experimental groups. They will be tested before anyone drinks caffeine, thirty minutes after consumption and one hour after consumption. After taking these data, I will be able to analyze it using graphs and standard statistical analysis. It is expected that those who drink caffeine and those who believe they are drinking caffeine will have a slightly faster heart rate and ability to do math facts, but their jump height will not change. These data will support the fact that caffeine has slight effects on the body, but nothing extreme. They will also support that the thought of caffeine in the body has the same effect as caffeine itself.

NAME(s)	<b>Noah Nielsen</b>	PROJECT NUMBER	<b>C16</b>
SCHOOL	Main Street Middle School	GRADE	<b>8</b>
TEACHER	Eli Rosenberg		
PROJECT TITLE	<b>Polymer Bouncing Balls</b>		

### ABSTRACT

The purpose of my science fair project is to use different materials to create a polymer bouncing ball and control its characteristics by testing different ratios in the polymer recipe. My hypothesis is that there will be a pattern in the bounce data I collect that corresponds to the quantity of the ingredients in my recipes. I will be mixing different amounts of Elmer's White Glue, distilled water, and Borax to create a bonding material that will bounce, and then I will measure the height of the bounce to see which ratio of ingredients bounces the highest. After collecting my data I saw that the more borax added to the glue, the less bounce. This is probably because the borax cross-linked the PVA so much that it made the ball harder, resulting in less elasticity. Now that I understand polymer chemistry, I would like to try to make the perfect bounce juggling balls, or perhaps further perfect the recipe for lacrosse balls.

NAME(s)	<b>Michael Nolan</b>	PROJECT NUMBER	<b>P29</b>
SCHOOL	Mancheste Elementary Middle School	GRADE	<b>8</b>
TEACHER	Scott Diedrich		
PROJECT TITLE	<b>Let There Be Light</b>		

### ABSTRACT

Efficiency of Different Colors of Light on Solar Energy

As our planet uses up our fossil fuels, we look to alternative energy. The purpose of this project was to study the efficiency of different colors of light and solar energy. The idea of the project was to see if one color could produce solar energy more efficiently than others.

I tested five colors, I would like to have tested more, but these were the only ones available to me; red, yellow, green, blue, and, purple. For a control, I left the solar panel uncovered. To change the color of the light, I covered the solar panel with colored cellophane. After which I used a voltage meter to see how much energy could be produced. My light source was a 100 watt bulb was placed nine centimeters above the solar panel. I did this because I felt that natural light would be too unpredictable and give me mixed results.

Each color was tested three times, and then the mean amount of volts was found for the color. The mean for blue was 3.153 volts, the least efficient. The most efficient was yellow with a mean of 3.364 volts. My other results were 3.276 volts for red, 3.202 volts for yellow, and 3.241 volts for purple.

Because I was not testing in a completely dark room natural light, and light from the ceiling could have affected my results. Unfortunately, I do not know by how much. Based on the results I have, yellow produced solar energy approximately 4.5 percent more efficiently than the control. I feel that this experiment should be recreated on a larger scale to confirm or deny any results.

NAME(s)	<u>Kelsey Norman</u>	PROJECT NUMBER	<u>B50</u>
SCHOOL	<u>Rutland High School</u>	GRADE	<u>11</u>
TEACHER	<u>Ann Marie Mahar</u>		
PROJECT TITLE	<u>Caffeine: An Over The Counter Heart Attack</u>		

### ABSTRACT

Caffeine is a legal stimulant that people in America, and all over the world, take in large quantities everyday. Whether it be in the form of coffee, energy drinks, soft drinks, chocolate, or even 200 mg over the counter pure caffeine pills, my method of testing. There have been two very different studies done on the effects of caffeine on the heart and problems that occur due to abnormalities in heart rate. One study proved that caffeine has positive effects in the form of coffee. One study proved that caffeine has positive effects on the heart in the form of coffee. It even stated that taking caffeine in the form of coffee even lowered the risk of heart disease. The other had a very different view on the effects of caffeine on the heart. This study stated that caffeine's effects can lead to different complications, which can lead to heart disease. One of those being prolonged increase in heart rate. I want to find out which study was correct, whether or not caffeine has negative effects on the heart rate caused by an increase with consumption. I believe that caffeine will negatively affect the heart rate of human beings, as modeled by *Daphnia magna*, or more commonly known as "water fleas", as consumption is increased.

To prove this I monitored *Daphnia magna* under a compound light microscope in depression slides to allow for proper viewing. To test the effect of caffeine, I will use the resting heart rate, without any added substance to the spring water, as the control for the experiment. The variables will be the amount of caffeine added to the solution that increases the concentration of caffeine per milliliter of water in each test. These strengths of caffeine will be 50 mg, 100 mg, and 200 mg. To find the average heart rate and average increase, each trial will be performed three times.

Through this testing, my hypothesis was proven to be correct. The results I obtained showed that when the levels of caffeine were increased, so too did the heart rate of the *Daphnia magna*. The increase in heart rate reached close to 100% of the resting heart rate when the individual was placed in the 200 mg solution. The average rate reached 444 beats per minutes from the resting heart rate of 234 beats per minute, a change of 89.74%. Because of the results, the experiment obtained its objective, to prove that caffeine negatively affects heart rate by increasing as the intake of caffeine increases.

NAME(s)	<u>Ben Norton</u>	PROJECT NUMBER	<u>B51</u>
SCHOOL	<u>Mill River Union High School</u>	GRADE	<u>10</u>
TEACHER	<u>Carolyn Raiford</u>		
PROJECT TITLE	<u>Bottle Biology</u>		

### ABSTRACT

○If your mother has ever warned you about sharing water bottles, and how you might become sick due to the spreading bacteria, then this project only goes to prove her right. The main point of this project is to show the presence of bacteria in unwashed, reused water bottles, which are commonly carried around for efficiency. Over the course of the experiment, a clean water bottle was used and reused 12 times (6-8 hours between each use, with out sterilizing), and swabbed for bacteria growth. Following this, 12 Petri dishes (containing nutrient agar) were streaked with the bacteria sample, each dish representing one use. After incubation and continued observation, the process yielded the desired, albeit disgusting, results: the bacteria growth in the water bottle had steadily increased over each use.

○The data collected consisted of observations of the Petri dishes, counting of colonies, or presence of a bacterial lawn or partial lawn. The independent variable in this project was the number of times the bottle was reused. The dependent variable was the resulting bacteria growth.

○This incredibly rapid growth, all which had taken place over a period of only 4 days (3 uses per day), is frightening because of our knowledge that many bacteria can spread disease. If bacteria are allowed to grow to such staggering amounts (as they already have been) in any water bottles across the globe, then disease may be spread faster by the sharing of an essential life source between, say, teammates, or maybe coworkers, which is a sad realization. Seeing the extremely fast reproduction of this bacteria should convince any owner of a reusable bottle to wash it more frequently.

NAME(s)	<u>Lindsay Osgood, Leslie Rogers</u>	PROJECT NUMBER	<u>GP20</u>
SCHOOL	<u>Green Mountain Union Middle/High School</u>	GRADE	<u>8</u>
TEACHER	<u>Mr Garvin</u>		
PROJECT TITLE	<u>Windmill Power</u>		

**ABSTRACT**

Our topic is on windmills and how much energy they create. The question we answered was: what numbers of blades create the most energy? Our hypothesis is the more blades there are the more energy it will create. Our methods were to count how many revolutions per 30 seconds, the more times it spun the more energy it produces. Our second method was to use a spring scale to test how much weight it could pull up, the more energy it produces the more weight it can pull up. The results were the more blades there were the more energy it produces. This means that 8 blades create the most energy.

The windmill will spin the most with 8 blades then it will with 2. The windmill will pull up the most mass with 4 or 6.

NAME(s)	<u>Jack O'Sullivan-Griffith</u>	PROJECT NUMBER	<u>C17</u>
SCHOOL	<u>Mater Christi School</u>	GRADE	<u>6</u>
TEACHER	<u>Ms. Donlon</u>		
PROJECT TITLE	<u>Food is Fuel</u>		

**ABSTRACT**

In the experiment Food is Fuel, the calories released by the food groups: carbohydrates, proteins, and fats were compared. To do this, the equipment had to be set up. Two utility clamps and a ring clamp were attached to a ring stand. The first utility clamp had the thermometer suspended into the calorimeter can. The calorimeter was suspended from the ring clamp. Below the ring clamp was the second utility clamp. In this utility clamp was the food. The food was burned with a safety lighter.○○○○○

The hypothesis stated: If foods containing carbohydrates are burned, then more calories will be released than from foods containing fats or proteins. It proved incorrect. There are four Calories per gram in carbohydrates. Like carbohydrates, proteins contain four Calories per gram. In contrast to proteins and carbohydrates, fats contain nine Calories per gram. The foods high in fat released roughly twice as many calories as carbohydrates and proteins. The foods high in carbohydrate had approximately the same calories per gram as the food high in protein. The two foods containing the most fat averaged 1997 calories per gram. The two foods high in carbohydrate had an average of 554 calories per gram. Last, the food high in protein contained 451 calories per gram. These numbers were obtained by doing calculations. To get the calories lost by the food, which equaled the calories gained by the water: the masswater, change in temperature, and 1 cal per gram degrees Celsius were multiplied. To get the calories per gram of food, the calories lost by the food were divided by the mass of the food burned.

○

NAME(s) **Melanie Oliva** PROJECT NUMBER **B52**  
SCHOOL Manchester Elementary Middle School GRADE **8**  
TEACHER Scott Diedrich  
PROJECT TITLE **School Makes Me Sick! Which area of our school has the most bacteria?**

### ABSTRACT

This project is the result of experimentation on which area of the school has the most bacteria. The purpose of doing this project was to learn where bacteria are found and where it can maintain life.

In my procedure I had five different places I got bacteria samples from and I tested for three trials. First I had to make the agar and letting it cool in the Petri dishes so bacteria colonies could grow on it. Then I collected bacteria samples and let the bacteria grow in a dark and warm place. I took observations and pictures of the growth every four days. On the twelve day I collected my data by measuring the percent of the Petri dish that was covered in colonies.

The data I collected measured the average percent of the Petri dish covered in bacteria colonies. Computer keyboards had the most colonies and covered 19.47 percent of the Petri dish. Cafeteria tables had the second most colonies and covered 12.37 percent of the Petri dish. The main stair railing had the third most colonies; it covered 10 percent of the Petri dish. The girls' bathroom had the second least colonies; it covered 9.53percent. The water fountain had the least amount and only covered 7.65 percent.

In my conclusion I found that computer keyboards had the most bacteria in our school. My hypothesis was incorrect. I learned that bacteria can live in many places and are everywhere you look. From researching this project I also learned how bacteria multiply; a process called binary fission.

NAME(s) **Steven Olson** PROJECT NUMBER **B53**  
SCHOOL South Burlington High School GRADE **10**  
TEACHER Curtis Belton  
PROJECT TITLE **How glucose effects mouse health**

### ABSTRACT

Sugar is a vital part to human life and most of all other types of life, but if too much sugar is consumed, then the organism will not be healthy. Too much sugar can cause bodily dysfunctions such as insatiable hunger, wounds that won't heal, extreme thirst, and even death. The purpose of this study is to determine how much sugar it takes to cause unhealthy conditions in living things. For this study, I went and bought six common white lab mice (*M. musculus*) and separated them into two cages. One of these cage is the control group, where the mice aren't receiving any special additions to their diet or any other part of their life. In the second cage though, I am giving the other three mice Coca-Cola instead of water. Because Coke has more sugar then regular water, which is what the mice in cage one are drinking, the mice in cage two will be receiving more sugar, which might cause visible signs of too much sugar for the mice. I am keeping a daily journal, to catalogue the mice's changes, physical and otherwise, and to see if there are any drastic changes, which will force me to end the experiment for the mice's safety. After I finish gathering the data, I will analyze it to see if there are any changes in the mice from the two cages, if the two groups are different in any way. So far, the mice from cage one (the control) are gaining weight, but not as much weight as the mice from cage two, which leads me to conclude, that so far all the mice are healthy to a degree, but the mice in cage two are overweight by mice standards.

NAME(s) **Miranda Orcutt** PROJECT NUMBER **B54**  
SCHOOL **Mater Christi School** GRADE **6**  
TEACHER **Michelle Donlon**  
PROJECT TITLE **Hydrogel and Bean Growth**

### ABSTRACT

Does hydrogel affect the growth of a scarlet runner bean? This question triggered this science project. If a scarlet runner bean were planted in one hundred percent hydrogel, another in one hundred percent potting soil, and a third in fifty percent hydrogel and fifty percent potting soil, then the bean in the fifty-fifty mixture should grow the best. Research resulted in the discoveries that bean plants need one inch of water per week, full sunlight, and should be planted one inch deep. Other findings were that hydrogel is a manmade polymer that can absorb five hundred times its weight in water, and that polymers are chains of molecules used in everyday objects. A similar experiment was performed by Morgan Selah to see which material would affect the growth of a pinto bean.

○On day one, the seeds were planted in three pots and watered. Pot A contained one hundred percent hydrogel. Pot B contained one hundred percent potting soil. Pot C contained fifty percent hydrogel and fifty percent potting soil. On day four, the seeds were fertilized. On day fifteen, the plants were watered. On all the testing days, the temperature was measured and information was recorded. Testing went on for twenty-one days.

○On the last day of testing, the plant in Pot A had grown seventy-five centimeters, nothing had sprouted in Pot B, and Pot CÆs plant had grown one hundred five centimeters and four millimeters. Because the hypothesis proved true, farmers and gardeners could use this information to help them make their scarlet runner beans prosper. They could also test if hydrogel improved the growth of any other plants. In the end, hydrogel did help the plant in the fifty percent hydrogel and fifty percent potting soil grow the best.

NAME(s) **Ellen Osowski** PROJECT NUMBER **S15**  
SCHOOL **Rutland High School** GRADE **11**  
TEACHER **Ann Marie Mahar**  
PROJECT TITLE **Can You Remeber...? Does Gender Affect Memory?**

### ABSTRACT

From personal experience, I have always noticed that it seems as if females are more likely to notice details or changes in their loves. For example, my dad does not usually notice when minor changes like haircuts or a slight shift of the furniture occurs. My mom, however, notices almost immediately. This appears to be the case for many people. That led me to the question of whether or not there was actually a difference between the memory capabilities of males and females. Some research on this led me to question whether if a crime occurred, males or females would be the more accurate eyewitnesses. Because to me it seemed as if females were more likely to notices changes, I thought that a female eyewitness would be more accurate because in order to notice a change, a person has to remember what the original looked like before it was changed. My purpose was to investigate the difference between the memories of the two genders. I hypothesized that females would have better memories than males.

○To test my hypothesis, I used forty high school age students, twenty male and twenty female, as test subjects. I told each test subject that I was going to show them a picture for thirty seconds and after which they would be given a serious of questions to answer about the photo. I then showed them the picture, timed thirty seconds, and once the thirty seconds had expired took the picture away and gave them a sheet with thirteen questions asking about details in the photo. They answered the questions as well as they could, and when they were finished, I took the tests back and marked those correct or incorrect. This data showed me that my hypothesis was correct. Of the twenty females I tested, only one answered more than five questions incorrectly.

<b>NAME(s)</b>	<b>Joyce Pan</b>	<b>PROJECT NUMBER</b>	<b>B55</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>Characterization of Notch Signaling and Actin Activity in Intracellular Domain of Cells</b>		

**ABSTRACT**

Actin, a protein that scaffolds or supports, the cytoskeleton of cells, is regulated by cell surface signaling proteins called notch and delta. This project will help identify whether notch directly or indirectly regulates actin. The protein notch is one of the receptor proteins that bind with the delta protein on the neighboring cells which in response produces actin, and has the ability to control the cell's destination and choices during development. The intracellular notch domain consists of several parts, the two main parts, the transcription activation and the ankyrin region. Three different protein notch cell lines are to be tested in this lab. The first is, NFull, also identified as N-B, and consists both the transcription activation and the ankyrin region, which is known to have a high level of actin when combined with the delta cell. The second is, the Ndeltacell, also known as N-PCR, consists the ankyrin region only, and it is not known whether this region will have a high content of actin when combined with delta. The final cell line is the NdeltaI, also identified as N-Intra, is neither the transcriptional activation nor the ankyrin region, and this cell line is also an unknown. The process involved in notch regulating actin is yet to be found. If notch regulates actin directly, then it involves its intracellular domain. If the intercellular domain of the notch regulates actin indirectly, it will imply that some other mechanism is regulating actin. The experiment shows so far that there is actin present in all three types of notch cells, but further analysis will need to be done in order to accurately quantify the level of actin and clustering between the cells.

<b>NAME(s)</b>	<b>Danielle Pape</b>	<b>PROJECT NUMBER</b>	<b>B56</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>Different Fertilizers Effects on Runoff</b>		

**ABSTRACT**

Agricultural runoff is the leading source of pollution for lakes and streams surrounding fields. With 330 million acres of agricultural land in the United States alone, the amount of pollutants that end up in the world's water is a huge amount. But, of all the fertilizers used which can cause the most harm, the nutrients, pesticides, compost, or top soil (the control) on fields. Based on my research, my original hypothesis was that pesticides would cause the most problems overall. For the experiment, I used: soil from my backyard, compost, pesticides, and manure. I set up a system with a section of soil and added pollutants leading into a section of water. I had two requirements for each pollutant; for one, the directions on how to use the product were followed, and the variable of the rain came early. To make it rain, I used a watering can. After it rained I found the pH and the phosphate levels of the water in the second section. I also observed the amount of soil floating on top of the water.

NAME(s) **Ajay Patel** PROJECT NUMBER **B57**  
SCHOOL South Burlington High School GRADE 9  
TEACHER Curtis Belton  
PROJECT TITLE Vermont's Waters Effect on Cyanobacteria

### ABSTRACT

Vermont has been known for having much phosphorus pollution from fertilizers, laundry detergents, and other household chemicals. In water with abnormally high nutrient levels (phosphorus), bacteria have been known to grow at a fast rate which can be harmful to an ecosystem. In my study I question if the levels of phosphorus in Vermont's waters affect the rate of cyanobacteria growth. The water being tested comes from Lake Champlain, St. Albans Bay, and Shelburne Bay. These waters are compared to the standard or control of distilled water testing. The recent 2007 lay monitoring report shows the following phosphorus levels: St. Albans Bay 37 ug/l, Shelburne Bay 17 ug/l, Lake Champlain 12 ug/l. My hypothesis is that the water with the most phosphorus will have the greatest growth which follows: St. Albans Bay, Shelburne Bay, Lake Champlain, and last distilled water. The waters will be boiled and separately mixed in with nutrient agar. Then each of the agars will be poured into petri dishes creating agar plates. Then a swab containing *Lyngbya* cyanobacteria will inoculate each dish in a 7 cm line. The plates will be sealed and put in a clear plastic bag, and set at room temperature in an area with plenty of sunlight. The bacteria colonies will be measured in area mm squared daily for two weeks. So far, in day 5 the results have shown that St. Albans bay has the highest growth rate, then in second is Shelburne Bay, followed by Lake Champlain, and last the distilled water. These correspond with the levels of the most phosphorus to lowest phosphorus. Overall, the data so far shows that the level of cyanobacteria growth is positively affected by phosphorus levels. The data supports my hypothesis of which water will have the highest bacteria growth.

NAME(s) **Mitchell Philbin** PROJECT NUMBER **B58**  
SCHOOL South Burlington High School GRADE 10  
TEACHER Curtis Belton  
PROJECT TITLE Growing Plants With Lake Champlain's Water

### ABSTRACT

Lake Champlain has been a home for various kinds of plants for thousands of years. Human activity has caused pollution to get into the Lake. Phosphorus has entered the lake from the runoff of lawn fertilizers and manure. Phosphorus is a nutrient that is essential to plant growth, but the increasing amounts of phosphorus put into the lake cause over fertilization which can have adverse effects on fish and animals. It was my intention to see if the increase of phosphorus levels in Lake Champlain would be useful for growing your own plants. To test this, I placed six 15g java moss samples into containers of two different water sources. Three samples went into containers filled with distilled water and three samples went into containers filled with water extracted from Lake Champlain. My hypothesis was that the plants that were in the lake water would grow more, because phosphorus provides plants nutrients to grow and there has been a steady increase in phosphorus levels. Based on my observations thus far, the plants in the lake water may be faring a little better than the samples in distilled water, but I will not know for sure until the final weighing has taken place. I expect to conclude that the water in Lake Champlain is good for plant growth and health.

NAME(s)	<b>Stefan Pierson</b>	PROJECT NUMBER	<b>B59</b>
SCHOOL	South Burlington High School	GRADE	10
TEACHER	Curtis Belton		
PROJECT TITLE	<b>Carbon Dioxide Production with Physical Exertion</b>		

### ABSTRACT

Carbon Dioxide (CO<sub>2</sub>) is known to be the bi-product of human respiration. CO<sub>2</sub> lowers the pH depending on the concentration and amount. Even though CO<sub>2</sub> can be toxic, it also has many industrial uses such as to make soda, fire extinguishers, and welding. A human respiratory system will never produce enough CO<sub>2</sub> for any industrial purpose, but I am trying to figure out how much CO<sub>2</sub> is produced and if it is affected by physical exertion. I am setting up an experiment that shows the amount of CO<sub>2</sub> produced by four different amounts of physical exertion. I am using pH solution to measure the amount of CO<sub>2</sub> that is produced. I am using four levels of exertion starting from resting, second is walking, third is jogging, and the last is sprinting. My hypothesis is that sprinting will cause produce the most CO<sub>2</sub> per breath due to the body trying to get as much oxygen out of each breath as possible. Of the people that participate, I will be taking survey containing height, weight, amount of exercise, and body mass index. This will allow me to determine if any of those factors have an effect of CO<sub>2</sub> production. To test the CO<sub>2</sub>, I will have each of the participants blow into a bottle containing pH indicator solution. I will then measure the pH and the lower the pH, the more CO<sub>2</sub>. I expect to see a rise in amounts of CO<sub>2</sub> as the levels of physical exertion goes up.

NAME(s)	<b>Seth Pietryka</b>	PROJECT NUMBER	<b>P30</b>
SCHOOL	Rutland High School	GRADE	11
TEACHER	Debra Hathaway		
PROJECT TITLE	<b>The Best Broadhead</b>		

### ABSTRACT

This science fair project is on the use of broadheads. The researcher would like to know what types of broadheads work the best. There is some researched on broadheads but not which broadheads might work the best. What type was the best because they all say that they're good but which one is the best? It was hypothesized that the Rage 3 blade slipcam broadhead would work the best. The researcher tested 5 different broadheads from 20, 30, and 40 yards and compared accuracy, penetration and the size of the holes that they cut. The researcher found that their hypothesis was correct; the Rage 3 blade slipcam broadhead did work the best. The researcher figured out what type of broadhead was the best and what type was the worst out of the broadheads that they tested.

<b>NAME(s)</b>	<b>Courtney Pollard, Ashley Austin</b>	<b>PROJECT NUMBER</b>	<b>GP09</b>
<b>SCHOOL</b>	<b>Green Moutian Union Highschool</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Mrs. Surma</b>		
<b>PROJECT TITLE</b>	<b>Bright vs. Dull</b>		

### ABSTRACT

Many restaurants serve bright colored foods more than duller colored foods because they want their customers to enjoy eating their food as much as looking at it. This leads to our science experiment: Do people tend to eat brighter colored foods more than duller colored foods? For a test ingredient we chose M&Ms because they come in many different shades and they all taste the same. We hypothesized that people would choose bright colored M&Ms more than duller colored M&Ms because they are more eye catching, normal colored, and they were common colors for M&Ms. To test this we bought a bag of Valentine M&Ms and a bag of regular M&Ms. We then took the red M&Ms out of the Valentine M&Ms and placed them in a bowl with the other bright colored M&Ms because they were already in the other bag. We also took the brown M&Ms out of the regular bag and placed them in the bowl with the other Valentine M&Ms since they were dull colored. Next, we had our testers tell us their age and told them to choose the brighter or duller colored M&Ms. After, they chose the bowl; they had to choose four colors within that bowl. We then recorded what bowl they chose from, what colors they chose, and why they chose it. Overall, we tested thirty-seven people. Five were adults who were over the age of twenty-five and thirty-two were children who aged from twelve to thirteen. In conclusion twenty-seven people chose brighter colored M&Ms because it was their favorite color. Ten people chose dull because it was their favorite color. Blue was the favorite of the bright colors and magenta was the favorite dull color. So, people do tend to eat bright foods more than dull colored foods.

<b>NAME(s)</b>	<b>Breanna Potter</b>	<b>PROJECT NUMBER</b>	<b>S16</b>
<b>SCHOOL</b>	<b>Mill River Union High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Carolyn Raiford</b>		
<b>PROJECT TITLE</b>	<b>Wavelengths of Light Vs. Afterimage</b>		

### ABSTRACT

○ This experiment was performed to find which wavelength of light produced the greatest fatigue on a person's eyes. The hypothesis was black would have the longest afterimage and green would have the shortest afterimage. The control group of this experiment was the black colored card, the independent variable in this experiment was color and time the test subject was shown the card, and the dependent variable was the amount of seconds the test subject saw an afterimage. This experiment was done by test participants who looked at different colored squares in the duration of ten, twenty, thirty, and then forty seconds, and the afterimage seen by the subject was recorded in seconds. Red produced the longest afterimage and blue produced the shortest afterimage. The durations of all the colors afterimages did not vary much from each other which suggests that different wavelengths of light do not have that much of an effect on the cones of human eyes.

○ Sources of error could have been the light in the room was not always constant and the distance the participant was sitting from the colored card could effect the intensity in which they absorbed the wavelengths of light, and therefore, the fatigue of the colors.

○ This experiment was helpful to real life because it allows a person to better understand how one's eyes work and how the colors they are seeing effect their vision. This experiment also could be extended by using different shades of each color to see if the duration of the afterimage became effected.

<b>NAME(s)</b>	<b>Hannah Potter</b>	<b>PROJECT NUMBER</b>	<b>B60</b>
<b>SCHOOL</b>	Green Mountain Union High School	<b>GRADE</b>	7
<b>TEACHER</b>	Karen Surma		
<b>PROJECT TITLE</b>	<b>Are Traits in Fingerprints Alike Between Family Members?</b>		

### ABSTRACT

I decided to study a topic that has been making me curious for years. Are fingerprint traits genetic, and passed on through a nuclear family? After a lot of resourceful research I believed that no, there would not be any traits and the fingerprint would have nothing in common. I examined four nuclear families, all ten of their fingers. I took every person individually and stamped their right thumb on a fairly large sheet of plastic. Then I applied black ink onto everyone of the individual person's finger and stamped it on a homemade FBI fingerprinting card. Once I had all of the one hundred seventy prints it was time for me to examine them all! I used a magnifying glass to look at every fingerprint and then I wrote down the results in my scientific findings journal. Then I read all of my notes and made side notes about patterns, traits, and other interesting things. I found a lot of traits within the families enough to say that yes fingerprint ridgeline pattern is genetic. Ridgeline pattern means the overall pattern such as a loop or a whorl. In most of the families I studied, three of the four family members shared the same pattern. I also found that ridgeline detail is not genetic according to my research, meaning that the small details that the naked human eye can't see really aren't genetic. I had thought maybe connections such as mother daughter would have a lot of traits. Mother daughter had the least in common compared to the father son connection that had a lot in common. Now that I am finished I realize that those other identification methods such as hair color, eye color, and more are all genetic and fingerprints would make perfect sense.

<b>NAME(s)</b>	<b>Ethan Prehoda</b>	<b>PROJECT NUMBER</b>	<b>P31</b>
<b>SCHOOL</b>	St. Francis Xavier School	<b>GRADE</b>	7
<b>TEACHER</b>	Mary Ellen Varhue		
<b>PROJECT TITLE</b>	<b>Solar Solutions</b>		

### ABSTRACT

The purpose of my first experiment was to discover the most productive angle to maximize the amount of energy generated by a solar panel. What is the optimum setting of a solar panel to maximize the energy generated? I think that the panels, when positioned at 45 degrees, will produce the most energy. The purpose of my second experiment was to see if color positively affects a solar panel's productivity. If the color of the cellophane covering the solar cells gets darker, then I think the amount of energy generated will decrease. First, during experiment 1 I set the panels at the first angle and took three readings from the multimeter. I repeated this process with each angle. In experiment 2 I set the panels at the most productive angle from experiment 1. Then I put the lightest sheet of cellophane onto the panels and took three readings from my multimeter. I repeated this for each different sheet of cellophane. I measured my responding variable in both experiments using a multimeter, set on the DC measurement. Experiment 1 resulted in 180 degrees being the most productive. In experiment 2 I discovered that a plain, non-covered solar panel is the most productive. The results of experiment 1 disproved my hypothesis, but the results of experiment 2 proved that hypothesis to be correct. If I were to further my studies of this experiment I would use real sunlight and maybe 1 large panel, because errors might have occurred by using the alligator clips. Overall I believe that both experiments were conclusive and turned out well.

NAME(s) **Vishnu Premsankar** PROJECT NUMBER **P32**  
SCHOOL **St. Francis Xavier School** GRADE **8**  
TEACHER **Mary Ellen Varhue**  
PROJECT TITLE **Windmill Efficiency**

### ABSTRACT

#### Purpose:

The purpose of my project was to test if the number of blades on a windmill and the size of the blades on the windmill affect the amount of energy that was generated.○

#### Hypothesis:

For the first test I think that the more blades a windmill has, the more energy it will create. I believe this because when you have more blades, the wind will contact the blades more and the windmill will rotate faster. For the second test I think the longer the blades the less energy will be created. I think this because if the blades are longer, then that means they are heavier. If the blades are heavier, then the wind will move the blades more slowly.

#### Procedure:

For my experiment I constructed a windmill that allowed for different size and number of blades. The windmill was connected to a generator that could be used to measure the energy that was produced.

I first placed the fan in front of the windmill. Then I inserted eight 6 inch long blades into the rotor. I turned on the fan. After that I recorded the average amount of energy it created in one minute. I did the same thing with 6 blades, 4 blades and 3 blades.

Next I inserted 9 inch long and 12 inch long blades and repeated the experiment.

#### Results:

My results were that the more blades there were on the windmill the more energy it generated. I also found out that the blade size had to be in the middle because if the blades were too long they were too heavy and if the blades were too small then there wasn't enough surface area to collect a lot of wind.

NAME(s) **Emily Provost** PROJECT NUMBER **B61**  
SCHOOL **Hinesburg Community School** GRADE **8**  
TEACHER **STephanie Konowitz**  
PROJECT TITLE **Can Vitamin Water Grow Plants?**

### ABSTRACT

Most plants only survive on water as their only fluid, but other formulas have been founded. Marigolds are a type of plant that can survive on a different source. The source I used to feed my marigolds was Glaceau Vitamin Water. The plants were grown in mini plant pots under an atrium and a growth light. In each pot were three marigold seeds. Since there are 15 flavors of Vitamin Water, I used 15 potted plants. Each plant had their own Vitamin Water flavors assigned to them. Over the time period of 2 weeks, the plants began to sprout but only two flavors sprouted green. The two flavors were Balance and Energy. Balance is used to balance out the vitamins in your body. Energy is used to give your body extra pep. I understand the results for Balance, IÆm guessing, balanced out the vitamins and nutrients in the plant. I also understand the Energy results because the vitamins in the drink could have made the seed over work to grow faster.

**NAME(s)** Matthew Rachek, Connor  
Trieb, Michael Morrissey **PROJECT  
NUMBER** GP10  
**SCHOOL** Christ the King - Burlington **GRADE** 7  
**TEACHER** Mrs. Vidula Srivastava  
**PROJECT TITLE** Reuse Don't Abuse

### ABSTRACT

In our hypothesis we believed that salt water would be purified into clean drinkable water.

In our experiment we poured salt water into a pan and used heat to bring the water to boil. The heat would cause the water to evaporate and produce condensation on the plastic cling wrap. We used coins to create a low point and drip into a bowl. The bowl was sitting under the low point in the pan.

Through this experiment we discovered new and easy ways to change salt water to fresh drinkable water without wasting much energy and electricity.

**NAME(s)** Jessica Ralston **PROJECT  
NUMBER** P33  
**SCHOOL** Green Mountain Union  
Middle/High School **GRADE** 8  
**TEACHER** Mr Garvin  
**PROJECT TITLE** Catching the Wind

### ABSTRACT

Many windmills and wind turbines usually have three or four blades. This makes me wonder: How would the number of blades on a windmill affect its speed and strength? My hypothesis was that the windmill with the least amount of blades would go the fastest but have the least amount of pulling power. To test this I had three different windmills with different number of blades and calculated the RPMs and strength of them. My results showed that the 8-bladed windmill was the strongest and the 4-bladed windmill went the fastest. The results show me that if a windmill has more blades, it will be stronger. It also shows me that if you have too many or too little blades, then it won't go as fast as it can.

NAME(s)	<u>Kyle Raymond</u>	PROJECT NUMBER	<u>P34</u>
SCHOOL	<u>Rutland High School</u>	GRADE	<u>11</u>
TEACHER	<u>Susan Ponto</u>		
PROJECT TITLE	<u>Trebuchet Trials</u>		

### ABSTRACT

This project was to demonstrate energy used in a lever. It demonstrates perfectly the transition from stored energy to kinetic energy, to test this a trebuchet was used. A trebuchet is a type of catapult that uses a lever to throw a projectile. The basic concept of operation of the machine is that when you push one end of the lever down, the other end goes up. By placing weight on the opposite end of the lever as the projectile it causes the projectile to be thrown. By increasing the counterweight, the projectile would be thrown a greater distance. To test this theory first a trebuchet needed to be built. Then the counterweight was systematically increased four times. Each time the counterweight was increased the projectile was thrown. The distance the projectile was thrown was measured and repeated twice for each weight. After collecting all of the data it was found that my hypothesis was proven correct. With the least amount of counterweight, 190 pounds, the projectile was thrown an average of 39 feet, 6.5 inches. For my greatest weight, 280 pounds, the projectile was thrown an average of 69 feet, 1 inch. The amount of counterweight made an apparent difference in the distance the projectile was thrown.

NAME(s)	<u>Alexandra Reedy</u>	PROJECT NUMBER	<u>B62</u>
SCHOOL	<u>Christ the King School</u>	GRADE	<u>8</u>
TEACHER	<u>Amy Wright</u>		
PROJECT TITLE	<u>EEW Dog's Breath!!!</u>		

### ABSTRACT

You know how your dog's breath always smells bad? Well I may have the answer to why that is so. My project is to see if some type of movement affects the smell of your dog's breath. When your dog runs or does some type of physical movement, their intake of air increases.

My dog is always coming up to me and licking my face. I know it is cute and all, but it smells horrible! I want to see if the reason why her breath smells so bad is because of all the physical movement she does.

To see how many times your dog breathes per minute count the number of times they inhale air for fifteen seconds. After fifteen seconds have passed, multiply that number by 4. This gives you the number of times your dog inhales per minute. Now make your dog do some form of physical movement, repeat the first step of counting how many times you dog inhales per minute. When testing more than one dog, repeat the same steps for each.

After I had completed my project I realized that the cause of my dog's smelly breath was actually the movement. When your dog does more movement, he or she inhales more. I had tested two dogs of two very different age groups. The younger dog had more breath intakes (as suspected), and had much more energy after finishing the physical movement. Over all I would not let your dog lick your face if they have done any movement!

NAME(s) **Yoonji Rhee** PROJECT NUMBER **S17**  
SCHOOL Mount Saint Joseph Academy GRADE 9  
TEACHER Timothy McCue  
PROJECT TITLE **Which picture can be remembered longer, black and white or color?**

### ABSTRACT

In this experiment, I am going to test between black and white picture and color picture to determine which you can remember longer. I choose this topic because I am interested in art and also felt that the results from this experiment could be helpful to people who work in advertising. Along the highway, in states other than Vermont, there are many billboards. They could be black and white or in color. I want to determine which one is more effective to viewer results in their business. Also shop owners could use the results from this experiment to help them decide what type of sign either black and white or color would be better. For this experiment, I want to find out if black and white or if color pictures, are more easy to remember.

NAME(s) **Brian Ribbans** PROJECT NUMBER **C18**  
SCHOOL Mount Saint Joseph Academy GRADE 12  
TEACHER Timothy J. McCue  
PROJECT TITLE **The Purification of Waste Vegetable Oil into Biodiesel**

### ABSTRACT

Biodiesel made from waste vegetable oil can be a viable alternative to petroleum-based fuel. It is possible that biodiesel will be one of the many solutions for sustainable alternative fuels. This experiment examines the results of varying the conditions during the transesterification process used to make biodiesel from waste vegetable oil. Transesterification is the process of breaking down esters, fat molecules, using alcohol and a catalyst producing a refined ester, biodiesel, and glycerin as a by-product. For this experiment varying amounts of methanol, the alcohol, sodium hydroxide, the catalyst, and temperature will test the results of the process.

To produce high quality biodiesel the results of the transesterification process requires additional processing to remove impurities, mainly glycerin, suspended in the oil. Mixing water with the oil does this. The glycerin and impurities will dissolve in the water and separate from the oil. A dry washing method is also possible. Magnesol is used by adding it in with the processed oil to absorb the impurities and filtering the magnesol with the impurities out. The completed oil is also tested for completion, the absence of impurities and pH. Altering the process will have dramatic affect on the result of the reaction and ultimately the quality of the biodiesel. The affects of varying the amount of lye, methanol and heat in the reaction will be apparent by the outcome of the biodiesel with a pH that is too high, an incomplete reaction and/or biodiesel with too many impurities. After testing, it was concluded that not using enough methanol, using too much or too little catalyst, and using a temperature that is too high or too low will produce poor quality and unusable biodiesel that is unable to pass one or more of the qualifying tests.

NAME(s)	<b>Bailey Ring</b>	PROJECT NUMBER	<b>S18</b>
SCHOOL	Manchester Elementary Middle School	GRADE	7
TEACHER	Scott Diedrich		
PROJECT TITLE	<b>Just Relax - Which method of meditation will lower your heart rate the most?</b>		

### ABSTRACT

The Purpose of my project is to learn more about stress and find the most effective way to reduce it. My stress reducers were controlled breathing, relaxing music, visualization and meditation. I picked this project because I get stressed out from school, theater and seventh grade drama normally and I just need to be calm. Also, it is good just to know this information for the future. I hypothesized that meditation would lower your heart rate because it was specifically designed to make you relax.

In my procedure, I took a control pulse on a middle schooler and then I had them breath controlled (Breath in, breathe outà that is what I mean.). I checked their pulse then I had them listen to L'Inverno (Winter) - II. Largo from the Four Seasons symphony composed by Antonio Vivaldi. I measured their pulse and then I had them watch a video from oceanfootage.com that showed waves rolling onto the beach. I checked their pulse and then had them meditate for two minutes. I checked their pulse for the final time then. I did ten trials for all four stress reducers.

The data I gathered showed that meditation lowered your heart rate the greatest amount out of all four. Controlled breathing, visualization and then relaxing music closely followed it. This data shocked me. I thought that relaxing music would be very unwinding but in fact, it heightened the anxiety level instead of having it drop.

In conclusion, meditation lowered your heart rate the greatest amount. I accept my hypothesis, and this knowledge is great for further use. The next time I get frazzled by whatever is stressing me, I can just find a quiet place and meditate instead of letting it get to me.

NAME(s)	<b>Bianca Rizzio</b>	PROJECT NUMBER	<b>B63</b>
SCHOOL	South Burlington High School	GRADE	10
TEACHER	Curtis Belton		
PROJECT TITLE	<b>Compost v. Fertilizer</b>		

### ABSTRACT

Compost is one of nature's unsurpassed mulches and soil amendments, and is very environmentally friendly. Commercial chemical fertilizer is commonly used by gardners because it is simple and utilizes the chemicals needed in the highest quantities for maximum growth. For my study, I posed the question which is more effective for maximum, time efficient, and healthiest growth; fertilizer or compost? My experimental design was basic. I had 6 plants, 2 were grown in compost as part of the experimental group, 2 were grown in chemical fertilizer as the other part of the experimental group, and 2 were grown in regular potting soil which acts as the control group. Each day I monitored the plants by watering them all with a standard 45 mL of water as well as documenting observations on their growth and health. The areas of observation consist of leaf coloring, height of plant, and leaf texture. Once my experiment finishes, I will analyze the collected data and show which potting material is the most beneficial. Although my data collection has not currently ended, as the results have thus far demonstrated I predict that the chemical fertilizer will show the fastest progress but the compost will exhibit the healthiest, and the potting soil will be somewhere in the middle.

NAME(s)	<b>Daniel Ro</b>	PROJECT NUMBER	<b>P35</b>
SCHOOL	Mater Christi	GRADE	6
TEACHER	Michelle Donlon		
PROJECT TITLE	<b>Rocket Science</b>		

**ABSTRACT**

Abstract

○ ○ ○ ○ ○ ○ ○ ○ The purpose of this project was to find out what gasses made a pressured rocket go higher. The original hypothesis was if one rocket uses CO2 and the other rocket uses oxygen then the CO2 rocket would go higher. Background research showed that coke and mentos had less of a reaction in cold weather rather than in warm weather. The rocket was first constructed. Then the launcher was constructed. The rockets were tested with CO2 and oxygen. The data was then measured.

○ To measure the rockets altitude you need to measure 96 ft. away from the launching point and put a tripod there with a stick attached to the top. You would line your eye up with the stick and the rocket when it reached its apex and keep it there. Then put a laser guided ruler beside the stick and put a protractor on top of it to measure the angle. The angle and distance away from the rocket were used to calculate the altitude of the rocket. I plugged this data in a formula, which was height equals distance away from the launching point times tan of theta. In conclusion the CO2 rocket went lower than the oxygen rocket because the cold weather caused less of a reaction between the coke and mentos than it would have been in warm weather, which caused the CO2 rocket to only get to 55psi rather than 60psi on which we fired the oxygen rocket. This explains why the CO2 rocket went lower than the oxygen rocket.

NAME(s)	<b>Laura Robertello</b>	PROJECT NUMBER	<b>G07</b>
SCHOOL	Christ the King, Rutland	GRADE	6
TEACHER	Mrs. Wendy Hackett		
PROJECT TITLE	<b>How do Earthworms' Diets Change?</b>		

**ABSTRACT**

My hypothesis is that the worm pot with the leaves in it will have the more worm babies because the leaves will disintegrate and will turn into fresh soil for the worms to eat. The reason I picked this project is that I wanted to do something that will help the environment and this project came to my mind and this experiment helps people with their gardens. This is what I did in my procedure first I got my pots and my worms and split them up into 5 groups one set in the control center, one set in the eggs pot, one set in the fruit, one set in the coffee grounds, and one set in the leaves pot. Then after a couple of week I counted up all the worms to see if they died or had babies. After that I tested the soil in the pots. I got all my information for my data table from counting all of my worms and I tested the soil with a soil analyst kit. My conclusion was that my hypothesis was wrong the coffee ground pot was the one with the most worm babies they started out with 40 worms and they had 7 worm babies so in the end the coffee pot has the most worms in the end of this experiment.

NAME(s)	<u>Deanna Rodolfy</u>	PROJECT NUMBER	<u>B64</u>
SCHOOL	<u>Rutland High School</u>	GRADE	<u>11</u>
TEACHER	<u>Timothy Gilbert</u>		
PROJECT TITLE	<u>Temparture and Vitamin C</u>		

### ABSTRACT

Purpose: To determine if heat effects the Vitamin C content of orange juice.

Hypothesis: The heat used to raise the temperature of the orange juice will have no effect on the amount of Vitamin C content in the orange juice.

Procedure: I made an indicator solution made of corn starch and water that would determine how much Vitamin C was in the orange juice. I measured the temperature of the orange juice and heated it for five minute increments in a test tube that was resting in a water filled stainless steel bowl on a stove top burner. I recorded the temperature in degrees Fahrenheit and then I took a dropper and counted how many drops of orange juice it took to turn the indicator solution light pink/clear, which would show how much Vitamin C was in the orange juice. I repeated the experiment with the bowl on the stove burner for five minutes longer than previously done.

Conclusion: My hypothesis was incorrect. The heat used to raise the temperature made the orange juice's Vitamin C content decrease.

NAME(s)	<u>Michelle Rogals</u>	PROJECT NUMBER	<u>G08</u>
SCHOOL	<u>Fair Haven Union High School</u>	GRADE	<u>9</u>
TEACHER	<u>Ben Worthing</u>		
PROJECT TITLE	<u>Comparison of the Production of Gases by Manure and Household Garbage Mixtures</u>		

### ABSTRACT

There are millions of tons of organic matter going to waste, so using them would be an effective, environmentally conscientious way of dealing with a potential source of energy. The experiment documented and compared the amount of gases produced by mixtures of 50 percent water and 50 percent manure (50 percent mixture) or 50 percent water, 25 percent manure, and 25 percent household organic matter (25 percent mixture). The application of this study is to determine if organic matter could be used as an additive to manure, resulting in the generation of a larger volume of gases such as methane. The methane, in turn, would be used to produce power. The 50 percent mixture will produce a larger volume of gases. At day 56 the 50 percent mixture had produced about 62 percent more gases than the 25 percent mixture. The gas production occurred at a slower rate than measured in the 25 percent mixture. The 50 percent mixture produced gas over the entire trial. On the other hand, the 25 percent mixture produced all of its gases suddenly and then halted on day 12. This sudden stop could be normal behavior or the methane-producing microbes could have died. There were only half as many microbes in the 25 percent mixture because there was only half as much manure to carry them in; they stood a greater chance of dieing. If this situation were normal behavior, it would prove to be a quicker way to obtain the gases from a sample and therefore possibly more effective. For example, in the time it takes to run one 50 percent mixture, you could run almost five 25 percent mixtures, resulting in about three times the amount of gases generated by the 50 percent mixture.

NAME(s)	<b>Leah Rogstad</b>	PROJECT NUMBER	<b>B65</b>
SCHOOL	Mill River Union High School	GRADE	10
TEACHER	Carolyn Raiford		
PROJECT TITLE	<b>Antibiotics Attack: How Much Does It Take to Get the Job Done?</b>		

### ABSTRACT

In today's society, antibiotics are a significant resource for treating bacterial infections, but the amount of antibiotics that should be administered to be most effective in killing bacteria is a constant concern. This project investigates how administering a higher dosage of antibiotics affects the amount of bacteria that is killed by the antibiotic. It was expected that if the amount of antibiotics administered increased, then the amount of bacteria killed would also increase. To test this hypothesis, antibiotic disks were applied to petri dishes swabbed with bacteria. The disks were placed on each petri dish in varying amounts (one disk, two disks, or three disks.) They were then placed in an incubator for 24 hours. After the incubation period, the diameter of the zone of inhibition was measured to determine which dosage killed the most bacteria. The amount of the bacteria (dependent variable) present on the petri dishes was dependent upon the amount of antibiotics administered (independent variable). *Escherichia coli* (gram-negative) and *Bacillus subtilis* (gram-positive) bacteria were tested, along with three different antibiotics: Erythromycin, Chloramphenicol, and Novobiocin. Regardless of the type of antibiotic administered or the type of bacteria tested, the amount of bacteria killed always increased as the number of administered disks increased. This proves that the hypothesis was valid in stating that by increasing the amount of administered antibiotics, the amount of bacteria killed is also increased.

NAME(s)	<b>Ben Rosenthal</b>	PROJECT NUMBER	<b>B66</b>
SCHOOL	South Burlington High School	GRADE	10
TEACHER	Mr. Curtis Belton		
PROJECT TITLE	<b>The Effect of Different Environments on Silkworm Populations</b>		

### ABSTRACT

The silkworm is the caterpillar stage of the common silk moth. Silkworms are very sensitive to germs, and if they are not kept in an environment that is clean and large enough, they will die. Silkworms come in containers that are large enough for them and with cleaning every other day they remain clean enough, but this lab will test just how much the level of cleanliness and size of the container effect the life of the silkworm populations. In order to test this I will study four different containers of silkworms and keep track of how many of the silkworms die every other day. The control container and all other containers will contain ten to fifteen silkworms. The control container will be of the size that the silkworms came in, the worms will be cleaned out, and the worms counted every other day. The second container will also be of store size but I will never clean out the container. The third container will be a quart sized container where the worms are counted and cleaned out every other day; this will allow me to test the effect of a larger environment on the silkworms. The last container will be pint sized, and will be cleaned out, and the worms will be counted, every other day; this will allow me to test the effect of a small container on the silkworms. I predict that the majority of the worms in the small and dirty tanks will die, and the majority of the worms in large and control tank will survive. By comparing the amount of living silkworms in each tank to the control tank I will be able to determine how the different environments effected the silkworm populations, and if it was positive or negative.

NAME(s) **Brianna Rotella** PROJECT NUMBER **B67**  
SCHOOL St. Francis Xavier School GRADE 7  
TEACHER Mary Ellen Varhue  
PROJECT TITLE **How much Acid Is Too Much**

### ABSTRACT

Purpose and Hypothesis: the purpose of my science fair project was to see how acid rain affects our environment. My hypothesis for this project was that the more acidic the water the more daphnia that would die.

Variables: My control variable in this experiment was the daphnia colony in the petri dish with the neutral water. The constants in my experiment were the amount of water in each dish, amount of food, and the same condition for each daphnia colony. The manipulated variable in my experiment was the pH level in each petri dish. The responding variable was the amount of daphnia that died in a certain period of time.

Experiment: For my experiment I took six petri dishes and for each I gave it a different pH level from three to eight. I then added daphnia to each dish and observed and recorded their initial reaction to the new pH. I measured the responding variable by marking how many daphnia had died in the first few minutes, first few hours, and each day for ten days. I used vinegar and baking soda to manipulate the pH level.

Results and Conclusion: The results of my experiment showed that my hypothesis is correct because it showed daphnia can't live in very acidic and very alkaline water. The best pH level is between six and seven. If I were to do this experiment in the future I would like to use a larger population of daphnia in each petri dish and I would also like to find some way to reduce the shock that comes to the daphnia when they are being transported and moved to different containers.

NAME(s) **Emily Ruggiano** PROJECT NUMBER **B68**  
SCHOOL Bakersfield School GRADE 7  
TEACHER Erin Paquette  
PROJECT TITLE **Beauty of the Beat**

### ABSTRACT

If a person listens to music with a heavy beat, how does it affect your blood pressure? I first had to learn to use a sphygmomanometer. Next, I needed someone to test. I then recorded their blood pressure before they listened to a heavy beat song or a soft beat song. Then, I had that person listen to a heavy beat song for thirty seconds. I did this because I wanted to give the brain a chance to get used to the song. After, I recorded their blood pressure for the second time. I then changed the heavy beat song to a soft beat song, the person listened to it for thirty seconds, and then recorded their blood pressure. Finally, I tested another person and started the process over.

In the end, my hypothesis was positive. Every single time, the person's blood pressure raised for the song "Let it Rock" and decreased for the song "Eine Kleine Nachtmusik". I needed to choose two completely different songs to get two completely different results. I learned blood pressure is affected by music and music therapy is a real profession.

NAME(s) **Maggie Sanborn** PROJECT NUMBER **C19**  
SCHOOL Christ the King School GRADE 7  
TEACHER Mrs. Wright  
PROJECT TITLE What Tastes Better? Bottled vs. Tap

### ABSTRACT

I tested to see if people preferred tap or bottled water. My hypothesis is that if people didn't know what they were drinking, they would like bottled water more. I noticed that there is a lot of money being spent each year on bottled water so I wanted to see if there is an actual difference. I marked A or B on the bottom of eighty cups and without looking at the bottom, my test subjects drank both samples and told me which one tasted better. The data showed that 18 people liked bottled, 18 people liked tap and 4 people didn't taste a difference. My hypothesis was not proven, 55% of my test subjects did not choose bottled water. I also asked everyone what they thought would taste better and 39 people out of 40 thought bottled water would taste better. If people don't know what kind of water they are drinking, they can't taste a difference.

NAME(s) **Christian Scanlon** PROJECT NUMBER **P36**  
SCHOOL St. Francis Xavier School GRADE 8  
TEACHER Mary Ellen Varhue  
PROJECT TITLE Electromagnets

### ABSTRACT

My project investigates the use of electromagnets to stop a moving projectile. I hypothesized that the configuration with four electromagnets forming an  $\delta$  shape will be able to stop the greatest amount of force. I intended to test configurations with two, three and four separate electromagnets. The manipulated variables in my project were the different configurations of electromagnets that I used. The controlled variables were the size and speed of the projectile, the layers of coils in each configuration, the sizes of the iron cores in the configurations, the battery used, and the length of each magnet in each configuration. I measured the responding variable by shooting the projectile at each setup of magnets and recording how much force they could take (in Newtons).

○As it turned out, the effect was opposite. The setup with two magnets stopped 30N of force, three magnets stopped 20N of force, and four magnets stopped 15N, proving my hypothesis was incorrect.

○If I were to do this experiment again, I would like to work on how to steady the projectile launcher. My original plan involved shooting the projectile through the air without a nail corner to use as a guide but I couldn't get its trajectory consistent.

NAME(s) **Leah Scaralia** PROJECT NUMBER **S19**  
SCHOOL **Christ the King, Rutland** GRADE **6**  
TEACHER **Mrs. Wright**  
PROJECT TITLE **The Stroop Effect: The Brain and Directed Attention**

### ABSTRACT

My science project was to test the Stroop Effect on different ages to see who was less confused by it. The Stroop Effect is the theory that states that you can read a word faster than you can think to say the color that the word is written in. I chose this experiment because I've heard about the Stroop Effect and wanted to learn more about who it affects. I found the subject interesting and I wanted to learn about how the brain works during this experiment. My hypothesis was that the younger age group (4 and 5 year olds) would be less confused and it would take a shorter time for them to take these tests. To do this experiment, I picked 5 random test subjects for each age group: 4-5 years old, 11-13 years old, and adults 40 years and up. I got them each on a computer and one at a time gave them two online tests. The first test was easier than the second. This project did not turn out the way I thought it would- the 4-5 year old group did the worst in timing on the tests. I also found out that after a certain age, everyone does almost the same on the tests, because the 11-13 year olds and adult subjects' average test times on the second, harder test were less than one second apart.

NAME(s) **Mara Scaralia** PROJECT NUMBER **G09**  
SCHOOL **Mout Saint Josepha Academy** GRADE **9**  
TEACHER **Timothy McCue**  
PROJECT TITLE **Testing Partical air Pollution in Rutland**

### ABSTRACT

My project was the test the particle air pollution in the Rutland areas and compare them to other places throughout the community. I got into this idea when I heard a commercial on the radio saying how clean and pure the air was here where we live and I wondered just how clean that was. I found out that they only tested the air in Burlington when they last tested it and decided to see how clean in was in Rutland.

I set slides covered in petroleum jelly out in different areas of Rutland, (Urban, rural and suburban areas) and left them out for several days to collect my data. When I recollected them all and observed them under a microscope, I found that the slides that were around the most people were the most polluted, even when compared to the bus stations, the slides set out near the sidewalks were the worst, where cars drove by and pedestrians, some of which were smoking, were the most polluted.

NAME(s) **Jay Schwalbe** PROJECT NUMBER **P37**  
SCHOOL Rutland High School GRADE 11  
TEACHER Tim Gilbert  
PROJECT TITLE **Dimples and Drag**

### ABSTRACT

This experiment is designed to test the effect of dimples on a golf ball's drag. I was interested in this because I gold, and the principle of drag is integral to the aerodynamics of flight. The first step in testing drag is to propel the balls through a gas or liquid, in this experiment water is used because its high density requires a lower speed to create large amounts of drag. To move the balls through the water, various options were considered, but ultimately a pendulum over a trough was the most effective because it was very consistent and allowed the ball to travel up to 140 feet without leaving the six foot trough. The pendulum could also be set to various weights, allowing for three sets of tests, at 5, 15 and 25 pounds. At each weight three tests were conducted with a control, no ball, a smooth ball, and a dimpled ball. Each test was conducted three times at each weight for accuracy, and the pendulum was allowed to swing for ten full swings. By analyzing video footage of each test and measuring the distance in inches of the ten return swings it was found that the dimpled golf ball traveled on average 3.74% further than the smooth golf ball when compared to the control. This proves that dimples allow the transition to turbulent flow to occur more readily. This turbulent flow decreases the size of the wake behind the ball, which reduces drag.

NAME(s) **Heather Selmer** PROJECT NUMBER **P38**  
SCHOOL Weathersfield School GRADE 8  
TEACHER David E. Lambert  
PROJECT TITLE **Wind Turbines- How the Blade Pitch Affects the Output Power**

### ABSTRACT

The problem that this project is experimenting on is, "Does the angle of the blade to the wind affect how much voltage the turbine generates?" My hypothesis was that yes, the angle of the blade does affect the output power of a wind turbine, and the best pitch to produce the most output power would be 10 degrees from being flat to the wind. I believe this because I found in my previous research a formula to make a wind turbine that had a pitch of ten degrees.

○At the beginning of my experiment, I first had to make my turbine and a wind tunnel to test the different angles in. First, I made the turbine blades and tapered them at seven degrees, which I have compensated for in my results. I made the hub of the turbine out of two pieces of wood cut into circles with a jigsaw and screwed them together with two screws. I then drilled three holes from the outside about two centimeters to the center of the hub. I made them evenly spaced around the outside, and just small enough for the blades to stay inside the holes when the two pieces are screwed together. I then made a small wind tunnel and put the fan at one end and the turbine at the other. I created a circuit out of a digital multimeter, the generator, and a load of 100 ohms to allow a current and to allow power to be generated.

During the testing, I first set the angle of the blade, and then I plugged in the fan and waited for it to get up to full speed. Once it was going at full speed, I took the reading that the digital multimeter was displaying and then unplugged the fan. I then set the angle again and repeated it for every ten degrees. When I finished doing one test for each setting, I went back and did it two more times. When I found an area of degrees that was better than the rest, I tested around in that area to find the very best one. Once all my testing was done, I converted all the voltage readings that the digital multimeter gave me to watts to allow me to display it in power rather than voltage.

<b>NAME(s)</b>	<b>Keegan Sheree</b>	<b>PROJECT NUMBER</b>	<b>S20</b>
<b>SCHOOL</b>	Green Mountain Union High School	<b>GRADE</b>	7
<b>TEACHER</b>	Ms Karen Surma		
<b>PROJECT TITLE</b>	<b>optical illusions</b>		

### ABSTRACT

I was testing how gender, age and the color of a visual affected the way the human eye perceives optical illusions. My hypothesis was that a greater percentage of people would see the white vase first. This is because I think that white pops out against most colors. My procedure was quite simple. I showed a group of people a picture that could be seen as either two faces looking at each other or as a vase. I showed thirty two people a green and white copy and asked them what they saw first. The participants were divided into four groups: male adults, female adults, male seventh graders and female seventh graders. Then I did the same thing to another thirty two people but this time the picture was black and white to test the affect color had on what they saw. In the end, more people saw the two faces, totally contradicting my hypothesis. I thought that it was interesting that more girls saw the vase and more boys saw the two faces. I think it had to do with negative and positive space. If I were ever going to do this project again, I would interview more people and have the picture printed in more colors. I would also gather data from more age groups.

<b>NAME(s)</b>	<b>Aiden Shumway</b>	<b>PROJECT NUMBER</b>	<b>G10</b>
<b>SCHOOL</b>	Hinesburg Community School	<b>GRADE</b>	8
<b>TEACHER</b>	Konowitz		
<b>PROJECT TITLE</b>	<b>A Changing World</b>		

### ABSTRACT

The whole world needs to better understand a global climate change, for it could change our lives. To fully conceptualize what or how it will affect the earth, it starts with the organisms on it. Plants are critical in the global ecosystem. They generate oxygen and feed us, and complete the balanced scale of life. Plants are affected by CO<sub>2</sub>, which is the most widespread greenhouse gas. A global climate change would kill off thousands of plant species that we need to survive. I designed an experiment that would demonstrate the short-term effect of CO<sub>2</sub> on plants. My experiment called for two (two liter) soda bottles. Each contained a bean plant, and one had an increased amount of CO<sub>2</sub> sealed in it, which I had created by mixing vinegar and baking soda. Throughout the time span of a week, the two plants were sealed in the containers. I recorded the data each week and discovered that the bottle with increased CO<sub>2</sub> levels produced an eleven-inch bean plant. The bottle with no increased CO<sub>2</sub> only reached a total height of four inches. This explains and simulates the future of Global warming on our earth. Although CO<sub>2</sub> is beneficial to plants in the short term, habitat change is not, and that will happen from the rising in global temperature if nothing is done to reverse the global crisis.

<b>NAME(s)</b>	<b>Madeleine Slack</b>	<b>PROJECT NUMBER</b>	<b>P39</b>
<b>SCHOOL</b>	<b>Rutland High School</b>	<b>GRADE</b>	<b>12</b>
<b>TEACHER</b>	<b>Susan Ponto</b>		
<b>PROJECT TITLE</b>	<b>Whats Under Foot?</b>		

### ABSTRACT

○For my science fair project I looked at the different types of footings in riding arenas used for stadium jumping and determined which was most effective in terms of reducing the impact level on the horse's legs. I took six samples of different types of sand (some plain and others mixed with felt, rubber, etc.) and used a force scale to determine how they worked to cushion the bones and joints in the horse's leg. I dropped a 2 N ball onto a tray containing a 3 inch sample of the footing, from a regulated height of 15 inches. I tested each sample five times and then came up with an average.

○My hypothesis was that a combination of R4 and crumb rubber would be most effective for reducing the impact level. I based this decision on my research about bones and joints in the leg and how they are affected by stadium jumping. I concluded that with a 50-50 combination of sand and rubber, the sand could stabilize the mixture while the rubber provided a cushioning affect for the leg. Though not entirely accurate, my hypothesis was not far from correct. I found that the most effective footing was plain R5 sand, followed very closely by a combination of R4 and crumb rubber.

○There were several sources of error I encountered during this project. For example there were small variations in the height from which the ball was dropped, the way in which the ball was dropped, and the location in the tray where it landed. Variations also occurred in the footing samples themselves, such as whether or not they were packed down, the packed samples producing higher readings on the force scale. This method of testing, however, seemed to be quite accurate. It does not, however, prove that R5 sand is the most effective footing for stadium jumping. It would be interesting to continue this experiment by looking into the other factors that must be considered for an arena footing, such as lifetime of the material, dust control, etc. and from there determine which footing would be best for the horse's overall health.

<b>NAME(s)</b>	<b>Carolyn Snell, Madeline Limanek</b>	<b>PROJECT NUMBER</b>	<b>GP11</b>
<b>SCHOOL</b>	<b>Christ the King School - Burlington</b>	<b>GRADE</b>	<b>6</b>
<b>TEACHER</b>	<b>Mrs. Vidula Srivastava</b>		
<b>PROJECT TITLE</b>	<b>Sunshine On My Shoulders</b>		

### ABSTRACT

For the 2009 Christ the King School Science Fair, we decided to test different levels of Sunscreen Protection Factors (SPF) against Ultra-Violet radiation (UV rays) to conclude if higher SPF levels would better protect our skin compared to lower levels. The hypothesis that we created was the higher the SPF, the better results you would receive of protecting your skin from Ultra-Violet radiation (UV rays).

The procedure that we took to accomplish the experiment was simple but the steps concerned were critical. Two tests were involved for the final analysis. For the first test, we placed four clear plastic bags which contained a string of UV beads, in sunlight. Three out of four of the gags were coated with a layer of sunscreen to protect the UV beads inside the bag. The second test that we did was similar but it involved different sunscreens. The results were that all of the sunscreen products did protect the UV beads from UV rays to a certain degree for a certain amount of time. However, the results were not exactly what we expected. In conclusion, the majority of the time, the higher the SPF, the better chance you will have of being protected from UV rays.

NAME(s) **Kim So Yeon** PROJECT NUMBER **B69**  
SCHOOL Christ the King school GRADE 8  
TEACHER Mrs. Wright  
PROJECT TITLE **The nose knows smell but How about taste?**

### ABSTRACT

My subject was "The Nose Knows Smell but How About Taste?". I did this experiment because I am very interested in human biology. Also my dream is becoming doctor.

I thought my volunteers couldn't guess my food with nose plug. But they would guess without nose plug. And I thought Lemon and Lime were easy to guess.

What I did in my experiment was take 3-4 volunteers and prepare 4 kind of food, 2 per each. They have to be sour, salty, bitter, and sweet. For first time, give them food with nose plug and for second time without nose plug.

I prepared lemon, kiwi, salty peanut, beef jerky, grapefruit, lime, banana, and choco pie. They mostly got lemon, lime, and banana. But with nose plug they couldn't guess food's name. Without nose plug they could guess food's name that well.

I found out that we cannot taste with nose plug that well. We need sense of smell to taste food.

NAME(s) **Hiro Soga** PROJECT NUMBER **B70**  
SCHOOL South Burlington High School GRADE 10  
TEACHER Curtic Belton  
PROJECT TITLE **E. Coli Mutation**

### ABSTRACT

Charles Darwin published his theory of natural selection in 1859 in his book *On the Origins of Species by Means of Natural Selection*. There were four main components of Darwin's theory and one of them was the struggle to survive or competition for resources. To create this competition for resource I will have *Escherichia coli* compete with each other for food and I will be able to observe if any mutations occur. Two groups of *E. Coli* will be used, one that will be fed the same amount of food all the time and will act as the control group. Both groups get the same amount of food each day for a few days and then I suddenly decrease the amount of food that is given to the experimental group and keep track of what happens to the experimental groups population. I expect to find that the population will at first drop very quickly until only a small group is left to survive, then the small group will learn to efficiently use the food and their population will grow faster than before and will continue to grow until it reaches the point where a larger group would not survive with the amount of food. If these results were to come true, that would mean the experimental group mutated to adapt to the lesser amount of food that was available to them.

<b>NAME(s)</b>	<b>Matt Solomon</b>	<b>PROJECT NUMBER</b>	<b>B71</b>
<b>SCHOOL</b>	<b>South Burlington</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Mr. Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>The Science of Sleep: A Study of How Cell Phone Radiation Affects Sleep</b>		

### ABSTRACT

Cell phones are a tool used very frequently in our society. From calling, texting and even gaming these pocket peripherals often shape the way we live our lives. But with all great things there are dangers. Reports have claimed that cell phones affect the quality of sleep in a negative way. Even small amounts of sleep such as naps have been reported to be affected by the 800 mega hertz of radiation that cell phones churn out all day. I am testing to see how the radiation from cell phones affects sleep during the naps of a variety of individuals. This testing and studying was completed at the Sheraton Hotel in accordance with the Fletcher Allen Sleep lab. Each of the three subjects were placed under an EEG machine which studied their brain waves during sleep. My hypothesis is that the radiation produced by a cell phone is not enough to affect a small time of sleep such as a one hour nap. As a control each one slept in a room that was free of any functioning electronic devices besides the EEG. Each subject slept for a time period of one hour per test. Each control subject was given about a week before the next test, where they were expected to turn off their cell phones before they went to bed on a regular basis. For the next two tests each subject was exposed to radiation from cell phone transmitters. The data collected from this experiment will most likely prove that cell phones did not play a role in the quality of their naps. This is most likely because the subjects never entered the REM cycle which most naps never fully reach. My data will support my hypothesis that cell phone radiation is not strong enough to affect naps.

<b>NAME(s)</b>	<b>Rainbow Squier</b>	<b>PROJECT NUMBER</b>	<b>G11</b>
<b>SCHOOL</b>	<b>Mill River Union High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Mrs. Raiford</b>		
<b>PROJECT TITLE</b>	<b>Poop Paper</b>		

### ABSTRACT

If paper was to be created out of an animal byproduct what manure would be used and how could it be done? Herbivore manure would be safest because their diet does not contain pathogens that could threaten human health. HorseÆs, cowÆs, sheep, and llamaÆs are all common herbivores that could be used. Each animals byproduct is a different consistency. The compaction of manure depends on the animals size and digestive system which attributes to the fibers sustainability. With different consistencyÆs of fibers there must be a manure that would create the strongest paper. How can this be predicted? HorseÆs are the only animal out of the four that are not ruminant, therefore they have longer, stronger fibers which would create the strongest paper. To test this hypotheses paper can be created by boiling down manure to sterilize and blending with small amounts of tissue paper, wood ash, liquid starch, and flower petals. Thin paper sheets can be created by pouring the blended mixture over a screen immersed in water, then lifting the screen to create an even thin layer of mixture, blotting out excess water and letting dry. A simple way to test strength is to screw a small piece of dried paper over the opening of a jar, then placing weights on the suspended paper and recording what it can withstand. ○After completing this experiment, using horse, cow, sheep and llama manure and testing strength. I found the hypothesis made in the beginning was correct. Horse manure does in fact create the strongest paper. This experiment proves that paper can be created out of animal manure and could be an interesting and eco friendly alternative. It shows how something as unexpected as manure can create something beautiful and unique.

NAME(s)	<b>Benjamin St. Clair</b>	PROJECT NUMBER	<b>P40</b>
SCHOOL	Mater Christi School	GRADE	<b>8</b>
TEACHER	Ms. Michelle Donlon		
PROJECT TITLE	<b>Before Dot Com, There Was Dot Dash</b>		

### ABSTRACT

The purpose of the experiment was to see what the best transmitting wire gauge is for the telegraph antenna. The hypothesis was that gauge twelve would work the best. The telegraph was built in three parts, a buzzer, a key, and a battery. The key was a simple switch that opened and broke the current flowing through the telegraph. The buzzer was a simple electromagnet with a strip of metal suspended over it. Each time the telegraph was keyed, the current would flow through the metal over the electromagnet and make contact with a nail next to it. This would create friction, causing the metal to spark. Those sparks would transmit radio waves, audible through AM radios.

○After testing, it was found that gauge four AWG wire worked the best. While collecting the data a trend was evident. The trend was that the lower the gauge, or the thicker the wire, the broader the range of the antenna. Thicker wire works best because it can deliver more power or more amps. Thicker wire also creates a broader standing wave ratio curve. SWR is the distance a standing wave can transmit a radio signal.

○Throughout the experiment a few sources of error occurred. Those included the radio antenna moving around and the nail becoming too magnetized. Even with the possible errors, however, the experiment definitively proves that thicker antenna wire results in a larger transmitting distance. This data is extremely relevant to the real world because antennas are used all over the world.

NAME(s)	<b>Joshua St. Clair</b>	PROJECT NUMBER	<b>M03</b>
SCHOOL	Mater Christi School	GRADE	<b>8</b>
TEACHER	Ms. Michelle Donlon		
PROJECT TITLE	<b>Wikiality?</b>		

### ABSTRACT

The common belief is that Wikipedia is written by anyone who chooses to contribute information. Therefore, the facts are inaccurate and the information is untrustworthy. The idea of this experiment was not to prove whether Wikipedia is completely accurate, but to determine where it is most inaccurate. This experiment tested the unsupported information and facts in three articles under four main categories, specifically, names, commands, numbers, and dates. Because dates can be debatable and often written incorrectly, this category should prove to be the most inaccurate one.

Of the four categories, names and commands were most accurate. Both had an average correct percentage around ninety-six percent among the three articles. When a name or command was listed, all information following that listing had to be completely accurate. This makes up most of the information in a given article. The only mistakes in those categories occurred either because of some ambiguity or because the information was out-of-date. The consistent accuracy, however, clearly disproves the notion that information on Wikipedia is untrustworthy.

The numbers and dates categories were less accurate. They scored around eighty-eight percent and ninety-three percent respectively. Although the averages were fairly high, they proved to be very inconsistent. The categories would be one hundred percent correct in one article, but only eighty percent in another. Because the categories were measured by one fact alone, either a date or number, it was more likely for them to be inaccurate.

The common belief about Wikipedia is correct in one regard and incorrect in another. Facts on Wikipedia, such as dates and numbers, are often inaccurate, but the actual information concerning a topic, such as names and commands, is cited, well written, and, overall, mostly correct.

<b>NAME(s)</b>	<b>Kelly St. Marie</b>	<b>PROJECT NUMBER</b>	<b>C20</b>
<b>SCHOOL</b>	<b>St. Francis Xavier School</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Mary Ellen Varhue</b>		
<b>PROJECT TITLE</b>	<b>Fabric Feud</b>		

### ABSTRACT

**Purpose:** New fabrics and fabric blends are being created all the time whether for the purpose of warmth or elegance. The purpose of my science fair project was to see what type of fabric provides the best insulation. My hypothesis for this experiment was that the fleece fabric would prove to have the best insulation.

**Experiment:** The controlled variables in my experiment are the same type of cup, the same thermometer, the temperature of the water, the same sized fabrics, the same amount of water in each cup, and the same conditions throughout the experiment. The manipulated variable is the type of fabric being used. The responding variable is the temperature of the water after 15 minutes has gone by.

**Results:** The results of my experiment were that both the wool and fleece fabric prove to have the best insulation. These results show that my hypothesis should be accepted because even though wool had a higher average water temperature than fleece by .1 they are too close to say that one is actually better than the other. If I were going to do this experiment again in the future I would have liked to test more types of fabrics and find ways for my experiment to be more accurate.

<b>NAME(s)</b>	<b>Elizabeth Stanley</b>	<b>PROJECT NUMBER</b>	<b>C21</b>
<b>SCHOOL</b>	<b>Rutland High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Debra Hathaway</b>		
<b>PROJECT TITLE</b>	<b>Testing For Levels of Vitamin C</b>		

### ABSTRACT

The experiment tested eight different fruit juices and juice drinks to find which had the highest level of vitamin c present. A vitamin c indicator made from potassium iodide, iodine, corn starch and ethanol was used to achieve this. This was done by filling a test tube with three milliliters of the vitamin c indicator. Labeling all the test tubes, one for each juice, the corresponding fruit juice was added with a dropper. The number of drops it took to turn the fluid in the tube from the bright blue color of the indicator, back to the juice's natural color indicated how much vitamin c was present. So, the more drops the less vitamin c. The experiments showed that the fresh squeezed fruit juices had surprisingly low levels of vitamin c. in comparison to the other juices tested the fresh squeezed juices fell within middle range. The three juices with the highest levels of vitamin c were store bought orange, orange made from frozen concentrate and tomato. Not surprisingly, the Power-C flavored Vitamin water had the lowest levels.

The juice with the highest level of vitamin c was store bought orange. There was a difference between store bought, ready to drink orange juice and store bought orange juice from concentrate. Taking into consideration that the manufacturers of the juice add more vitamins and health benefits to the juice than what is found there naturally, it only makes sense that store bought orange juice would have more than, fresh squeezed.

NAME(s) **Flora Su** PROJECT NUMBER **B72**

SCHOOL South Burlington High School GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **The Relationship between Calcium Lactate Crystal Growth on Cheddar Cheese and Exposure of**

### ABSTRACT

Calcium lactate crystallization on Cheddar cheese is a plague to the dairy industry. Appearing as white specks on the surface of the cheese, most consumers reject cheeses with the crystals, mistaking them for unwanted microorganisms, such as mold. Scientists have conducted numerous tests in hopes of eliminating calcium lactate crystallization. This experiment tested the effect of exposing cheese to room temperature before long-term storage in a refrigerator on calcium lactate crystallization. It was hypothesized that cheese exposed to room temperature for a longer duration would experience more crystallization. The effect of surface roughness on crystallization was also tested by measuring the percent of the cheese surface covered in crystals on a rough surface versus that of a smooth surface. After cutting and packaging the cheese samples at the same tightness, the control group was immediately placed in a refrigerator set at one degree Celsius. One group in the experimental portion of the test was placed in a refrigerator set at 21 degrees Celsius before moving it into the one-degree-Celsius refrigerator, while the other remained in the 21-degree-Celsius refrigerator for 48 hours. Photographs of each sample were taken at one-week intervals, and photographs were analyzed at three-week intervals. The mean of the percent coverage of crystals of the three samples in each group was calculated and used for data analysis. The control group experienced crystal growth earlier than the experimental groups. It also had a higher rate of increase in crystal nuclei. However, two of the three 48-hour cheeses grew mold. The rough surfaces showed more crystallization than the smooth surfaces in all three groups, supporting the results of previous tests. These results do not support the hypothesis that increased exposure of cheese to room temperature results in increased calcium lactate crystallization, but it may increase the risk of mold growth.

NAME(s) **Andrew Tang** PROJECT NUMBER **B73**

SCHOOL South Burlington High School GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **How Various pH Levels of Water Affects Plant Growth**

### ABSTRACT

With two thirds of the earth's surface covered by water and the human body, consisting of 75 percent of it, it is evidently clear that water is one of the prime molecules responsible for life on earth. Water is essential for human survival and most other living things. Humans need water to regulate body temperature and to provide the means for nutrients to travel to all organs. Plants require water also for transport and to achieve photosynthesis. Water can have many different levels of acidity, and we can observe how high and low acidity affects the health and growth of plants. For my study, I tried to determine where water with different pH levels would be located. I collected untreated water samples from the McNeil Plant (Lagoon water), and Lake Champlain; artificial acid rain, and tap water as a control. My hypothesis is that the healthiest plants will be watered with: tap water, Lake Champlain, Lagoon water, then acid water; in that order. I planted Cherry Belle RadishÆs in an indoor plant starting kit, 9 plants per water sample. The plants are artificially lit during the day, and watered daily to simulate a normal environment. Growth patterns and health of the plants are measured to determine how various pH levels of water affects the growth of plants.

<b>NAME(s)</b>	<b>Michael Teixeira, Celena O'Brien</b>	<b>PROJECT NUMBER</b>	<b>GP12</b>
<b>SCHOOL</b>	Christ the King School - Burlington	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	Mrs. Vidula Srivastava		
<b>PROJECT TITLE</b>	<b>How's The Blade Made?</b>		

**ABSTRACT**

The reason we performed these tests on blade designs and materials is to let people know what they should use if they should use if they have their own windmill and want their best results.

The material should be sturdy but not too light or too heavy. We found that balsa wood and corrugated plastic are good materials to work with. As for design the knife shaped corrugated plastic rotated at the highest velocity with whatever wind speed or angle of the blade was present.

We ordered a package of balsa wood and corrugated plastic boards and cut them to different designs. We tested each one individually under different conditions, adjusting them when necessary. We then found our conclusion.

<b>NAME(s)</b>	<b>Lucy Terrien, Makena Couture, Henry Atkins</b>	<b>PROJECT NUMBER</b>	<b>GP13</b>
<b>SCHOOL</b>	Christ the King School/ Burlington	<b>GRADE</b>	<b>6</b>
<b>TEACHER</b>	Mrs. Vidula Srivastava		
<b>PROJECT TITLE</b>	<b>Is freshness " In the Bag"?</b>		

**ABSTRACT**

Lucy, Makena, and Henry did an experiment on "Is Freshness in the Bag". We had six bananas. We put two bananas in the Debbie Meyer Green Bags. We put two bananas in the Ziploc bag and two left out of the bag. We did the same with kiwis.

We found that the green bags kept the bananas fresh for for a long time, while the Ziploc kept the produce fresh for a longer time. The opposite happened with the kiwis. The Ziploc kept the kiwis fresh for a shorter period of time while the Debbie Meyer Green Bags kept the produce fresh fir a longer period of time.

<b>NAME(s)</b>	<b>Alexander Thomas</b>	<b>PROJECT NUMBER</b>	<b>G12</b>
<b>SCHOOL</b>	<b>fair haven union highschool</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Thomas Smith</b>		
<b>PROJECT TITLE</b>	<b>Water Filtration</b>		

### ABSTRACT

#### Abstract

○I am using different combinations of fine sand, course sand and small pebbles to find what mixture filters the best. I think that the filter filled with only fine sand will filter the best because it has the smallest particles throughout the filter. I took two, two liter soda bottles and removed the top off of one and put a hole in the side of it and then cut the bottom off the other bottle. The bottle that had the bottom removed I covered the neck of the bottle with a screen then attached a two inch section of rubber tube. Then I attached an elbow to the rubber tube and placed the entire apparatus inside the other bottle with the top cut off, filling them accordingly with different mixtures of filtering particles. After the experiment was over I found that both times I did the experiment the results were the same. Both times that I did this experiment I found that the water that was sent through the sand filter was clearer than all the others. This proves that the filter with all fine sand in it filters the best. I know this because it filtered out the most blue particles out of the water.

<b>NAME(s)</b>	<b>Halie Thompson</b>	<b>PROJECT NUMBER</b>	<b>B74</b>
<b>SCHOOL</b>	<b>Rutland High School</b>	<b>GRADE</b>	<b>12</b>
<b>TEACHER</b>	<b>Debra Hathaway</b>		
<b>PROJECT TITLE</b>	<b>Electrolytes</b>		

### ABSTRACT

Physical activity is a part of everyday life. During physical activity your body needs many things to remain healthy. One of the most important things is electrolytes. Electrolytes are substances that turn into ions and give your body power to contract its muscles for physical activity. As you may know electrolytes are lost through sweat when participating in physical activity. It is very important to replace these electrolytes and put them back into your system. There are many sports drinks that advertise electrolyte content. In this day and age there are so many of them how is one supposed to know which drink to consume? This experiment tests nine different commonly consumed sports drinks for their amount of electrolytes through their ability to produce currency. A liquid's currency and its number of electrolytes vary directly. This means the higher the currency the more electrolytes the liquid has. The drinks tested are all very popular and well advertised beverages that you can get in almost any store. Through this experiment it was found that the most popular and most well advertised drink did not have the highest content of electrolytes. The predicted hypothesis was that Gatorade would have the most electrolytes in it since it is what is seen on almost every professional sports sideline. Through the experiment the hypothesis was proven wrong and it was very surprising to find Gatorade came in third place. Surprisingly plain old apple juice placed before Gatorade. These results can be used to educate one on what they should consume during exercise to receive the highest number of electrolytes. The more electrolytes you have the more awake and motivated you will be during your work out.

<b>NAME(s)</b>	<b>Ryan Thornton</b>	<b>PROJECT NUMBER</b>	<b>P41</b>
<b>SCHOOL</b>	<b>St. Francis Xavier School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Mary Ellen Varhue</b>		
<b>PROJECT TITLE</b>	<b>Pack It, Ship It</b>		

**ABSTRACT**

○The purpose of my science fair experiment was to find out which packing material protects the item the best. I tested 5 different types of materials, Bubble Wrap, Styrofoam packing peanuts, Cornstarch packing peanuts, Cardboard mesh, and Fill-Air« bags. My hypothesis was that the Fill-Air« bags would work the best.

○For my experiment I used boxes, a glass bowl, tape, the packing materials I researched, and a 10 foot long wooden stick marked with 2 foot increments. I started by packing the glass bowl in the box. Then I dropped the boxes from 2 feet off the ground all the way up to 8 feet. When I examined the boxes, nothing had happened, so I tried several different ways to break the bowl. I eventually found that repeating my original test using apples instead of the glass bowls, worked the best.

○My results from the apple test found that all of the materials worked very well from an experimental point of view, I couldn't really conclude which material was the best. From an environmental point of view, the Cornstarch peanuts were the best because they can dissolve in water, and can be disposed of just about anywhere.

<b>NAME(s)</b>	<b>Emily Tornquist, Jessi Farrar</b>	<b>PROJECT NUMBER</b>	<b>GP14</b>
<b>SCHOOL</b>	<b>Green Mountain Union High School</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Karen Surma</b>		
<b>PROJECT TITLE</b>	<b>Green Manure Energy</b>		

**ABSTRACT**

In our experiment, we tested to see which type of animal waste gives off more biogas. Our variables were different animal feces—horse and rabbit. Our hypothesis was that the horse waste would give off more gas, because horses contain, digest, and filter more food through their bodies, versus a rabbit. If there are more food contents per gram of waste, then ultimately there would be more gas produced. We filled two different carboys with waste and water, and soon the connected balloon filled up with the methane and carbon dioxide produced. Our question to interrogate was to see which animal waste gave off the most gas in the given amount of time. We wanted to pursue this project so we could find the most efficient way to use an alternative energy. After the generator was made, we then recorded the measure of the circumference of the balloon in centimeters each day, organizing our data in a bar graph. Then, at the end of the thirteen day period that we were going to take our data, we could easily see distinctly different patterns in the size of the balloons. With the horse waste, about half a week into our experiment, we noticed that the balloon was clearly vacuum packing itself together, as opposed to the rabbit waste, which was producing more and more gas daily. We can conclude that the rabbit waste experiment gave off more gas in the given time frame. The total diameter of the rabbit balloon was 11.43 centimeters, and the horse balloon was only 10.16 centimeters. We think these specific conclusions may have been affected or altered by the level of urine in the rabbit waste. So secondly, we can conclude for this experiment that rabbit waste is the more efficient material in terms of biogas.

<b>NAME(s)</b>	<b>Paige Tremblay</b>	<b>PROJECT NUMBER</b>	<b>B75</b>
<b>SCHOOL</b>	<b>Mater Christi School</b>	<b>GRADE</b>	<b>6</b>
<b>TEACHER</b>	<b>Michelle Donlon</b>		
<b>PROJECT TITLE</b>	<b>How Long Does Your Headache Medicine Take To Dissolve</b>		

### ABSTRACT

#### Abstract

The purpose of the project was to find out which headache medicine dissolves the fastest in stomach acid (lemon juice.) My hypothesis was: If you put a Topcare Pain Relief pill in lemon juice, then it will dissolve the fastest because it is the smallest pill.

The research showed that from people's preferences that Tylenol Extra Strength is the most popular medicine, so that was used as the control group. The testing required a stopwatch to find out the time of the medicine dissolving. The medicines that were used were, Equate Aspirin, Kirkland Ibuprofen, Tylenol Extra Strength, Tylenol Arthritis Pain, and Topcare Pain Relief.

The procedure included putting two teaspoons of lemon juice into a measuring cup then putting a pill into the lemon juice when a stopwatch is started. When the pill is done dissolving, dump the remains in the sink and record the information.

Out of all those medicines, Equate Aspirin was the fastest to dissolve, followed by Kirkland Ibuprofen, Tylenol Extra Strength, Tylenol Arthritis Pain and lastly Topcare Pain Relief. The testing showed that as similar medicines may seem, they are different because they dissolve all different times! (Example: Tylenol Extra Strength and Tylenol Arthritis Pain!)

<b>NAME(s)</b>	<b>Kristen Trevino</b>	<b>PROJECT NUMBER</b>	<b>P42</b>
<b>SCHOOL</b>	<b>Rutland High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Ann Marie Mahar</b>		
<b>PROJECT TITLE</b>	<b>Bed of Nails</b>		

### ABSTRACT

To show the relationship between force, pressure, and area, the experiment was created. The experimental board is a scaled down version of a larger bed of nails that a person can lay on. The reason that the board is scaled down is to save time, money, and so it can be more testable. The mock bed of nails grid was created carefully in three sizes, 2 cm, 1.5 cm, and 1 cm. The three different sizes will show if the greater area, then the greater the force could be without having the balloon pop. So to test the hypothesis, the balloons were weighted, then placed on the bed and the amount of nails the balloons was resting on was counted, if the balloon did not pop right away. Then there was weight added to the top of the balloons and the amount of nails was counted, because the balloon expanded. Weight continued to be added until the balloon broke.

After the three sizes were tested, with at least five balloons, the weight per nail was calculated. The weight per nail for each board was relatively the same. But the balloons that were on the 1 cm board held more weight per nail than the 2 cm board. This part was a little surprising, but it still makes sense. Because the nails were closer together when the balloons expanded under weight, it was able to rest on more nails if the nails were close enough to reach. When the nails were further apart, the balloon could not reach the next nail, so it exploded.

If another board was made with the nails closer, similar results are expected. The nails would be able to hold more weight per nail than the nails in the other experiment, but only slightly more.

NAME(s)	<b>John Triano</b>	PROJECT NUMBER	<b>C22</b>
SCHOOL	Northfield High School	GRADE	11
TEACHER	Cynthia Tomczyk		
PROJECT TITLE	<b>The Effect of Various Amounts of an Aluminum Hydroxide Solution on the Time (Seconds) Need</b>		

### ABSTRACT

The real life issue in this lab is how using antacids can affect digestive processes in the stomach. This lab obtained data by adding various amounts of aluminum hydroxide, a popular active ingredient in antacids, to a simulated gastric juice, which is 0.5 molar hydrochloric acid saturated with pepsin, and measuring the various amounts of time it takes for the pepsin to break down 1.0mL of egg albumin, using Biuret's Solution as an indicator. The average time of reaction when powdered aluminum hydroxide was used are: 0g of added: 97 seconds; 0.1 g of added: 142.33 seconds; 0.2g of added: 198 seconds; 0.3g of added: 223.33 seconds; 0.4 g of added: 241 seconds; and 0.5g of added: 254.33 seconds. The average reaction times when a liquid aluminum hydroxide solution was added instead of it in powdered form were: 0.0mL of solution added: 38.6 seconds; 0.5mL of solution added: 42.6 seconds; 1.0mL of solution added: 72 seconds; 1.5mL of solution added: 96.6 seconds; 2.0mL of solution added: 107.3 seconds; and 2.5mL of solution added: 123 seconds. The average reaction times when reactions took place in a 37 degrees Celsius water bath were: 0mL of solution added: 39 seconds; 1.0mL of solution added: 84 seconds; 2.0mL solution added: 98 seconds; 3.0mL of solution added: 122 seconds; 4.0mL of solution added: 139 seconds; and 5.0mL of solution added: 148 seconds. The amount of time it took for pepsin to break down the egg albumin increased as the amount of aluminum hydroxide solution added did as well. This is because the aluminum hydroxide increased the pH of the simulated gastric juice, causing the pH to fall out of the range known as pepsin's optimum pH. Because of this, the average time increases, and then begins to flatten like a typical optimum pH curve.

NAME(s)	<b>Robert Tuttle</b>	PROJECT NUMBER	<b>B76</b>
SCHOOL	South Burlington High School	GRADE	10
TEACHER	Mr. Curtis Belton		
PROJECT TITLE	<b>Can A Short Term Exercise Program Help Improve Balance</b>		

### ABSTRACT

It has been shown that balance can deteriorate with age due to decreases in the vision, proprioception and vestibular systems. The Berg Balance Test has been shown to be a good tool to measure the balance of seniors 65 years and older. My hypothesis was that subjects that followed the exercise program set out for them closely would see a greater improvement, and this program while unusually short, could yield results. In my experiment I pre tested 10 good candidates for a balance class, this means that the subject originally scored a 50 or below of a maximum 56 on the Berg. My next step was to have the subjects attend four weekly balance classes with exercises led by a physical therapist. The subjects were also given exercises to perform at home to improve balance, and each one was called nightly to confirm that they were doing exercises. After the four week period each subject was post tested. My results showed that, in general, subjects that participated with home exercises more, and came to more classes showed greater improvement than those who did not. When looking at the final data it shows that the subjects who did more exercises at home and attended all four classes saw a greater increase on their Berg score than subjects who exercised at home less and attended fewer classes. This final analysis of the data supports my original hypothesis that a shorter term balance program done correctly can work as well as a long term one.

<b>NAME(s)</b>	<b>Stephen Tyler</b>	<b>PROJECT NUMBER</b>	<b>C23</b>
<b>SCHOOL</b>	<b>Rutland High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Susan Ponto</b>		
<b>PROJECT TITLE</b>	<b>Which Type of Juice has the Most Vitamin C?</b>		

**ABSTRACT**

My experiment is comparing the amount of vitamin C in orange juices and lemonades. The different kinds of juices being compared are frozen, bottled, and freshly squeezed. I thought that the freshly squeezed orange juice would have the most vitamin C because it had nothing added to it, and it wasn't sitting around in a bottle or a can. To get the experiment started I had to make a vitamin C indicator solution with iodine, water, and cornstarch. After I put an even amount of the solution into six cups and put drops of each juice into the separate cups. The least amount of drops the more vitamin C. The bottled orange juice had the most vitamin C because it probably had added vitamin C. The freshly squeezed lemonade had the most vitamin C for all of the lemonades because I didn't add any sugar and water to the lemon juice. If I were to change this experiment I would either add juices or make the lemon juice into lemonade.

<b>NAME(s)</b>	<b>Jillian Varin, Elizabeth O'Donnell</b>	<b>PROJECT NUMBER</b>	<b>GP15</b>
<b>SCHOOL</b>	<b>Christ the King School - Burlington</b>	<b>GRADE</b>	<b>6</b>
<b>TEACHER</b>			
<b>PROJECT TITLE</b>	<b>Have We Hit the Wall Yet?</b>		

**ABSTRACT**

We ran this experiment to see if columns support as much weight as walls do. We predicted that walls would support more weight and pressure than columns.

- We made a basic wall structure out of half of a display board and piled our school textbooks on the structure until it collapsed. We noticed that our walls were not able to hold pressure from the sides. They bent when they were bumped or slightly moved. We also made seven columns out of the other part of the board. We used the same amount of material as the walls, and piled the same number of textbooks on the columns. Three columns were able to hold the books, and they only used one-third of the material.
- Our hypothesis was proved wrong because when we tested the columns to see how much they would really hold, we found that they held three more books than the walls did - a total of eight more pounds! Using columns in buildings not only holds more weight, it saves materials as well.

<b>NAME(s)</b>	<b>Peter Vayda</b>	<b>PROJECT NUMBER</b>	<b>B77</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>The Effects of Environment on Produce Rotting</b>		

### ABSTRACT

Since humans have been in existence, they have been attempting to find the best way to preserve produce. For my study, I evaluated which environment allowed the most and least rotting of produce. I placed three bananas, three oranges and three avocados in six different environments: open air (as a control), regular plastic bag, green bag, hot, cold, and in front of a fan. My hypothesis was that the produce in front of a fan would rot the slowest, while the regular plastic bag would rot the fastest. In each environment I placed three of each type of produce. I kept them all in the same area, but I allowed enough space so that they didn't touch each other. The only two tests that weren't in the same area were the cold and the hot experiments. Each day for I examined the experiments and photographed them. Only when all three in an environment rotted did I end the experiment. When all the experiments had rotted I analyzed the dates that they rotted to determine results. Data collected so far has rejected my hypothesis because the fan environment's produce rotted the fastest (rotted 37.5% faster for bananas and 15.4% faster for avocados compared to control), and the green bag's produce has rotted the slowest (rotted 45.8% slower for avocados compared to control).

<b>NAME(s)</b>	<b>Austin Ventrone</b>	<b>PROJECT NUMBER</b>	<b>B78</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>How Proximity to Runoff Producing Roads Affects the Health of Potash Brook</b>		

### ABSTRACT

○The organisms in a body of water have always been an indicator of the streams health. The organisms are affected by a number of factors and many of these factors are chemicals that come from road runoff. The organisms can show the overall health of a body of water, unlike most tests that only show one certain characteristic such as pH. For my project I am using a D type net to collect samples of Benthic Macro invertebrates from the bottom of Potash Brook. I am doing this at a number of different sites, which included Dorset Street, near the state prison, near Hinesburg road, and as a control in a hiking trail. All of the sites were at different distances from impermeable (asphalt) roads that produce runoff. I collected samples from each site and recorded the number of each species. My hypothesis was that the control site, which is farthest away from runoff producing roads, would be the healthiest and the site by Dorset Street, which gets runoff from both Dorset Street and the Highway. Once I have all of the samples I will analyze the health of the stream by identifying whether the species collected indicate a healthy stream or an unhealthy stream and how many were at each site. My results will be the species that were identified and the total number of organisms of each species. From this data I will know whether proximity to runoff producing roads affects the health of Potash Brook

<b>NAME(s)</b>	<b>Olivia Vitagliano</b>	<b>PROJECT NUMBER</b>	<b>C24</b>
<b>SCHOOL</b>	<b>Christ the King School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Mrs. Wright</b>		
<b>PROJECT TITLE</b>	<b>Which Liquid Freezes Faster?</b>		

### ABSTRACT

My purpose for "which liquid freezes faster", is to see which liquid freezes quicker and the time it takes for them to freeze. I was interested in doing this experiment because of my curiosity about the amount of time it would take to freeze different liquids. Also, I want to know how long I have to wait until I could eat some of the frozen treats I make.

In my procedure, I measured 14 different liquids and poured them into an ice tray. I checked the liquids every 20 minutes when they were in the freezer.

In conclusion, water froze the fastest. Maple syrup, oil and germ-X, got really sticky. Some liquids didn't even freeze. I usually freeze water and orange juice, but now I'll freeze pickle juice too!

<b>NAME(s)</b>	<b>Margaux Von Buren</b>	<b>PROJECT NUMBER</b>	<b>C25</b>
<b>SCHOOL</b>	<b>Mater Christi School</b>	<b>GRADE</b>	<b>6</b>
<b>TEACHER</b>	<b>Michelle Donlon</b>		
<b>PROJECT TITLE</b>	<b>Juicy Fruits and Vegetables</b>		

### ABSTRACT

This analysis questioned whether a fruit's electro-motive force (voltage) correlates to its acidity (pH). The hypothesis statement was: If a fruit or vegetable has a high acidity level, then it will have a high voltage reading. The background research conducted for this experiment conveyed that the fruit or vegetable with the highest acidity would generate the highest voltage.

The set up consisted of the oscilloscope's probes (electrodes) clamped onto two screws. They were embedded into the fruit/vegetable about two inches apart. The fruit or vegetable was then tested three times each at a five second, fifteen second and thirty second period. This was then repeated with the lemon, orange, tomato, potato, and apple. After the testing was completed, a major theory surfaced: the fruit or vegetable's electro-motive force had no correlation to the acidity. Instead, the flesh density seems to have had more of an impact on the mV reading.

Test results produced the information of which fruit or vegetable had the most voltage. Interestingly, the potato had the most electro-motive force followed by the lemon, apple, orange, and tomato. The most surprising finding observed throughout this project was that despite its low acidity level, the potato resulted in the highest mV reading.

<b>NAME(s)</b>	<b>Eliza Warren-Shriner, Kvehl McDermott, Maya von Wodtke</b>	<b>PROJECT NUMBER</b>	<b>GP16</b>
<b>SCHOOL</b>	<b>Brattleboro Union High School</b>	<b>GRADE</b>	<b>12</b>
<b>TEACHER</b>	<b>Jake McDermott</b>		
<b>PROJECT TITLE</b>	<b>The Effect of Snowmaking on Soil Quality</b>		

**ABSTRACT**

This study examines the effects of snowmaking on soil quality at Vermont ski areas. The purpose of our research was to determine whether or not artificial snowmaking has an impact on the soil quality. We hypothesized that snowmaking would impact soil quality, but that any change would be dependent upon conditions at individual mountains. To investigate our hypothesis, we conducted a series of tests comparing soil samples from snowmaking and non-snowmaking trails at six mountains. Soil samples were taken and analyses were made to measure pH, nitrogen, phosphorus, potassium and temperature. General vegetation and soil observations were also made. These tests were conducted at Bromley Mountain, Mount Snow, Stratton Mountain, Mad River Glen, Hogback Mountain, and Okemo Mountain. Hogback Mountain provided our control because it has never used artificial snow, but was once a ski area. A total of 27 samples were taken for analysis. To minimize variables, we chose sites with similar elevation, directional orientation, and general conditions for both snowmaking and non snowmaking trails.

After making site observations and collecting and chemically testing soil, we had data that allowed us to compare soil conditions at snowmaking and non-snowmaking sites at each mountain. We also looked at the data as a whole, examining trends that appeared from mountain to mountain. Our data suggests that there are chemical discrepancies between soil samples taken from snowmaking and non-snowmaking sites. There appear to be differences in the data for nitrogen and pH levels that are consistent and that are experimentally significant.

<b>NAME(s)</b>	<b>Ian Watkins, Luke Hammer</b>	<b>PROJECT NUMBER</b>	<b>GP17</b>
<b>SCHOOL</b>	<b>Main Street Middle School</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Eli Rosenberg</b>		
<b>PROJECT TITLE</b>	<b>Static Electricity</b>		

**ABSTRACT**

Different materials produce more static electricity than others. We wanted to find out which produced the most. Our hypothesis was that wool would produce the most static electricity because when we take wool shirts off they shock a lot. We made two hanging leaf electroscopes but they were not sensitive enough. We made an electronic electroscope for our experiment. We tested each material by rubbing it on a PVC pipe for 20 seconds, then walking forward until the light on the electroscope turned on. After we tested each material we recorded it on a spreadsheet and in a graph. We found that rubber and fiberglass conducted the most static electricity with wool and cotton close behind. This experiment surprised us that the two best insulators produce the most static electricity.

<b>NAME(s)</b>	<b>Rose Watts</b>	<b>PROJECT NUMBER</b>	<b>B79</b>
<b>SCHOOL</b>	<b>Hinesburg Community School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Stephanie Konowitz</b>		
<b>PROJECT TITLE</b>	<b>Flying Feathers</b>		

**ABSTRACT**

Many chicken owners clip their chickens' wings. The purpose of this is to keep them from straying too far or to keep them from flying out of their coops. But how much does it really change? The purpose of my experiment was to find out the effect that clipping chickens' wings have on how far they fly.

I clipped four of my chickens' wings. I then tested each chicken three times. One with no cut, one with a one and a half inch cut and one with a two and a half inch cut.

Only some of my chickens did what I thought they would, which was to not fly as far when I clipped their wings more. I thought that they would go farther when their wings were clipped less. That only some of the chickens did what I thought they did, is why the graph/table shows only a small amount of change. I think this was partly due to my errors (see sources of error). The results varied depending on the chicken I tested. Chicken's need as much of their feathers as they can get, which is why they might not fly as far. The feathers that I cut were their primary wing feathers, which they need to fly far and straight.

<b>NAME(s)</b>	<b>Caroline Weaver</b>	<b>PROJECT NUMBER</b>	<b>B80</b>
<b>SCHOOL</b>	<b>South Burlington High School</b>	<b>GRADE</b>	<b>12</b>
<b>TEACHER</b>	<b>Curtis Belton</b>		
<b>PROJECT TITLE</b>	<b>Prevalence of Human Papilloma Virus in Young Vermont Women, Implications for the HPV Vacc</b>		

**ABSTRACT**

A vaccine for preventing cervical cancer has been clinically released to the public in the last 2 years. The vaccine includes Human Papilloma Virus strains 6, 11, 16, and 18. HPV-16 and 18 are high-risk virotypes and account for more than 70 percent of invasive cervical carcinomas. It has been recommended that all young girls receive the vaccine in hopes that it will prevent the further development of HPV and possibly cervical cancer.

This experiment has investigated the prevalence of Human Papilloma Virus in young women with negative cytology in three at-risk populations in Vermont, including 13-18 year olds, 19-24 year olds, and 25-30 year olds.

DNA was extracted, purified, and quantified from samples collected from young women diagnosed as negative (age range 14-30 years old). HPV screening was performed with highly sensitive RT-PCR tests that detect early infection. Samples that tested positive were then sequenced using dot blot hybridization.

Preliminary data indicates that from the negative cytology samples, 24 percent of women ages 14-19 and 48.5 percent of women ages 20-24 tested HPV positive. Both groups demonstrated infection with high risk virotypes; however the older group had a wider variety and higher prevalence of high risk HPV types. This indicates that infection occurs early and that longer exposure increases risk, supporting the current vaccination policy.

<b>NAME(s)</b>	<b>Ethan Wennberg</b>	<b>PROJECT NUMBER</b>	<b>B81</b>
<b>SCHOOL</b>	<b>Rutland High School</b>	<b>GRADE</b>	<b>11</b>
<b>TEACHER</b>	<b>Ann Marie Mahar</b>		
<b>PROJECT TITLE</b>	<b>You've Got A Lot of Optic Nerve</b>		

### ABSTRACT

Objectives/Goals: This study was done to test whether the optic nerve disc, or "blind spot", at the rear of the eye was larger for males than for females.

Methods/Materials: Thirty subjects (16 females, 14 males) were tested using a measurement device created for this experiment. Testing only with the subject's dominant eye, the difference between the point at which the image disappeared and reappeared was found to be proportional to the size of the optic disc. Results for male subjects and female subjects were analyzed to see if there were significant differences between the genders. Analysis included finding the mean, median, and interquartile ranges and plotting the results on a box plot.

Results: Males had a mean diameter of slightly over 2mm, and females had a mean diameter just under 2mm. There is little statistical data to prove that males have a significantly larger blind spot than females.

Conclusions/Discussion: Results indicate almost no difference in the estimated diameter of the optic disc between males and females, thus disproving my hypothesis that males would have a greater blind spot than females.

<b>NAME(s)</b>	<b>Dillan Westcom</b>	<b>PROJECT NUMBER</b>	<b>B82</b>
<b>SCHOOL</b>	<b>Bakersfield School</b>	<b>GRADE</b>	<b>7</b>
<b>TEACHER</b>	<b>Erin Paquette</b>		
<b>PROJECT TITLE</b>			

### ABSTRACT

My question was what effect does phosphate potash and urea nitrate have on oat seed? Does a combination of fertilizers or nothing added to the oats work better? My hypothesis was that if the parts of the fertilizers do certain have certain jobs then it will do all of those jobs when combined and grow the seeds will grow better.

The first I did was put two cups of dirt in a tray with a certain amount of oat seed. I then watered them when needed and observed growth and recorded data every day for eight days. Then after the oat seeds were an inch tall I added the fertilizers. All of them were the same size until I added the fertilizers. The sample with no fertilizers added grew eighteen centimeters, the one with combination offertilizers grew seventeen centimeters, the phosphate grew sixteen centimeters, the potash grew fifteen centimeters, and the one with nitrate grew fourteen centimeters.

My hypothesis was proved wrong, the sample with no fertilizers added had grown the best. The fertilizers should be tested for long term use. The nitrate sample seemed like it was burnt short, thin, and ugly.

<b>NAME(s)</b>	<b>William White</b>	<b>PROJECT NUMBER</b>	<b>C26</b>
<b>SCHOOL</b>	<b>Windsor High School</b>	<b>GRADE</b>	<b>10</b>
<b>TEACHER</b>	<b>Jennifer Townsend</b>		
<b>PROJECT TITLE</b>	<b>Effects of acid rain on seed germination</b>		

### ABSTRACT

Acid rain or δAcid Precipitationö occurs when pollution emitted from smoke stacks and cars is deposited into cloud droplets. The most commonly found pollutants in acid rain are nitrogen oxides (NOx) and sulfur dioxide (SO2). When acid rain falls to the Earth it can affect the biology of lakes, rivers, plants, and ecosystems.

○In this project I have examined the affects of acid rain on the germination of broccoli seeds. A seed is essentially in hibernation and germination is the resumption of growth. Seeds will begin to germinate when the soil temperature is in the appropriate range and when water and oxygen are available. By replacing the water with an acidic solution that replicates acid rain I was able to examine the germination of the seed.

○ To germinate the broccoli seed I use glass pie dishes and paper towels to create an environment in which it supported the germination of the seed. I used three different concentrations of nitric acid. One was acid rain with a pH of 4 the second was a strong solution of acid rain with a pH of 1. The last was control of water that was neutral with a pH of 7. With the results I gathered from this experiment I was able to draw the conclusion that acid rain has an adverse affect in the germination of seeds.

<b>NAME(s)</b>	<b>Josh Wolfstein</b>	<b>PROJECT NUMBER</b>	<b>B83</b>
<b>SCHOOL</b>	<b>Renaissance School, Shelburne, VT</b>	<b>GRADE</b>	<b>5</b>
<b>TEACHER</b>	<b>Eve R. S. Dubois</b>		
<b>PROJECT TITLE</b>	<b>Classroom Genetics</b>		

### ABSTRACT

I am trying to find out whether tongue rolling is the dominant gene. I decided on doing this project because I have met people that can roll their tongues and people that can't.

My hypothesis is that tongue rolling is the dominant gene because I have met more people that can roll their tongue than people that can't roll their tongue. I have taken a survey or the class and their parents to see how these genes carry through in families.

Phenotype is a physical characteristic: in this case, tongue-rollers or non-tongue-rollers. We inherit one gene or allele from each parent. Two alleles are possible: tongue-rolling (R) and non-rolling (r). Genotype is the genetic makeup or the set of two alleles that a person has. The possible genotypes in tongue rolling are: RR, Rr, and rr. One allele comes from each parent, as can be illustrated with a Punnett square. If tongue rolling is the dominant gene (R), it is expressed even when the recessive gene (r) is present.

My mother and my sister can't roll, but I can roll, and my father can roll. Out of 16 children in our class, 12 of the children can roll their tongue, and 4 children cannot roll their tongue.

Tongue rolling is 3 times as likely as non-tongue-rolling. Tongue rollers are unlikely to have two non-rolling parents. Non-tongue-rollers are unlikely to have two parents who can roll.

This supports the theory that the tongue rolling gene (R) is the dominant gene. One data point (tongue roller who states he thinks both parents can't roll) is unreliable. If true, tongue rolling may not be simple dominant/recessive.

<b>NAME(s)</b>	<b>Whitney Woods</b>	<b>PROJECT NUMBER</b>	<b>C27</b>
<b>SCHOOL</b>	Green Mountain Union Middle School	<b>GRADE</b>	7
<b>TEACHER</b>	Mrs.Surma		
<b>PROJECT TITLE</b>	<b>Does Color Effect Taste?</b>		

### ABSTRACT

○My project that I tested was if the color of sodas effected itÆs taste. My hypotheses was that color would effect the taste because I thought that when people saw the color of the soda they would say, oh this is for example red so some people said it was cherry soda. My materials were 4 different kinds of sodas, (sprite, orange, brisk, coca-cola) red, blue, green, and yellow food dye, several cups, several spoons, and red, blue, green, and yellow permanent markers. What I did first was I marked one soda red and one cup red and one soda yellow and one cup yellow and so one. Next, I put the matching color of food dye with the matching color of food dye. Then, I put one spoon in each cup so people could test the sodas evenly. After I asked the person first if they liked it then what they thought it was and finally after they tried them all if they liked the sodas before they tried them. So based on my results I think that color does and doesnÆt effect taste because I think what happened was when they saw the color of the soda they thought it was a soda that was that color.

<b>NAME(s)</b>	<b>Nicole Wright</b>	<b>PROJECT NUMBER</b>	<b>B84</b>
<b>SCHOOL</b>	Green Mountain Union High School	<b>GRADE</b>	7
<b>TEACHER</b>	Mrs. Karen Surma		
<b>PROJECT TITLE</b>	<b>Plants Hydraed with Water or Milk?</b>		

### ABSTRACT

Nicole wright  
3/1/07  
Abstract

The purpose of this project is to see weather plants/vegetables grow best in water, milk or a mixture of both. I split up my radishes into 5 cups and watered them with the solutions of 100% water, 100%milk, 50% water/ 50% milk, 75% milk/ 25% water or 75%water/ 25% milk. The results were radishes watered with 75% water/ 25% milk grew the best and 100% water was the second best, the 50% water/ 50% milk and the 25% water/ 75% milk were the same height and are the 3rd best. Just as I thought milk was the worst.

<b>NAME(s)</b>	<b>Dominic Wysolmerski</b>	<b>PROJECT NUMBER</b>	<b>B85</b>
<b>SCHOOL</b>	<b>Christ the King School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Amy Wright</b>		
<b>PROJECT TITLE</b>	<b>What's growing on your handbag?</b>		

### ABSTRACT

The purpose of my project is to observe the microorganisms in one's immediate environment. It is to find out if the microbes are transferred to common objects such as handbags.

My hypothesis is that the microbes are transferred from various surfaces to common objects by ordinary use of the object. Bacteria is acquired in an unintended manner as a result of where ladies place their handbags: shopping carts, public restroom floors, kitchen counters, restaurant floors, car floors, movie theaters, and offices.

I developed a sample collection questionnaire for 11 sample purses and prepared a "Feild Collection Kit" containing: sterile saline, sterile swabs, zip lock bags, questionnaire forms, writing materials, and a digital camera. I requested samples and interviewed 11 volunteers. Samples were collected by moistening a sterile "QuTip" with sterile saline and swabbing the bottom of each handbag. The specimens were sealed in individual zip-lock bags and labeled with markers #1-#12. I then inoculated and sealed 11 Petri dishes on the 7th, 10th, and 14th day. I made micro-slides, took pictures, charted growth proportions, and recorded the data in charts.

I concluded that there was a significant microbial contamination on all of the test handbags. In almost every instance the owners of the handbags placed them on/in areas that would be suspect for microbial contamination. My final conclusion was that apparently, women do not clean the bottom of their purses.

<b>NAME(s)</b>	<b>Kathleen Young, Paige Hauke</b>	<b>PROJECT NUMBER</b>	<b>GP18</b>
<b>SCHOOL</b>	<b>Mater Christi School</b>	<b>GRADE</b>	<b>6</b>
<b>TEACHER</b>	<b>Michelle Donlon</b>		
<b>PROJECT TITLE</b>	<b>Yeast Activation</b>		

### ABSTRACT

#### Abstract

The project was, "Water temperature affecting yeast activation." The question of the project was, "How does yeast react in different water temperatures?" The hypothesis was, "If the water is warmer, then the bread will rise more." In the end, the hypothesis was incorrect.

The topics researched were, "How yeast makes bread rise," "What is yeast," and a yeast experiment. These were all researched on the internet and wrote by different authors. The websites and authors have been included in the bibliography.

The set up was simple: Collect the ingredients needed to make the bread and heat or cool the water to the correct temperature. The procedure included, mixing water, sugar, yeast and combining with dough that you have already made and cooking.

Data collection was done by weighing the different breads and calculating the volume and density of each trial. Two trials were cooked and measured for their different water temperatures. Our water temperatures were, 40 F, 130 F and for our control group we used 100 F water.

In conclusion, the control group trial came out the best, as expected, followed closely by the hot water bread and lastly the cold water bread. One highlight of the experiment was a little error in the ingredients during the testing but other than that, the project went as planned.

<b>NAME(s)</b>	<b>Allison Zengilowski</b>	<b>PROJECT NUMBER</b>	<b>S21</b>
<b>SCHOOL</b>	<b>Hinesburg Community School</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Stephanie Konowitz</b>		
<b>PROJECT TITLE</b>	<b>Put Your Best Intelligence Forward</b>		

### ABSTRACT

Howard Gardner believed that every person has 8 different intelligences. These intelligences show define the human race, who we are as individuals, and how we learn and understand information. This experiment was designed to test and see if students were adaptable to different styles of teaching, even if it was not their strongest intelligence. The outcome of this experiment would help us to see if more schools should focus on differentiated learning. Students in 7th and 8th grade were taught about one topic using a verbal lesson, a visual lesson, and a hands on lesson. Then the students wrote a paragraph indicating what lesson they felt they learned the best from. Their answers were then compared to each student's strongest intelligence (based on a survey). As it turns out, 39% of the students found the lesson the matched their strongest intelligence was the most effective in learning new information. The rest of the students found one of the other lessons to be more beneficial to grasping the new concepts. Although only 39% of the students matched up, differentiated learning should be a much more important issue throughout the country. This means that about 2 out of every 5 students may not be getting the type of teaching they need. If the teachers in our society only use one certain style, children may get turned off from learning because it is harder to understand in the way it is presented to them. We need to make sure that each and every student out there can learn to the best of their ability. That may mean that teachers should learn more about differentiated learning and how to expand their instruction so that students can get the most out of their education.

<b>NAME(s)</b>	<b>Zachary Zuk, Audrey Terrien, Siwadh Viwattanamas</b>	<b>PROJECT NUMBER</b>	<b>GP19</b>
<b>SCHOOL</b>	<b>Christ The King-Burlington</b>	<b>GRADE</b>	<b>8</b>
<b>TEACHER</b>	<b>Vidula Srivastava</b>		
<b>PROJECT TITLE</b>	<b>Say Farewell To Your Cell</b>		

### ABSTRACT

In the age of wireless technology, a worry has developed about the possibly harmful electromagnetic radiation emanating from our technology. Electromagnetic radiation (EMR) is used by many electronic devices such as, computers, microwaves, and cell phones. Some believe EMR is the cause of headaches,sores,and,most seriously, brain damage. In our experiment we tested the effects of EMR on living plant cells. We observed how plants growing near a cell phone developed, as opposed to plants growing away from it. Based upon the outcome of our experiment we will have more insight into the embedded harm of EMR.

Cell phones use EMR at a microwave frequency. This frequency is also used in microwave ovens,radios,and computers. Our hypothesis was that EMR from the cell phone would negatively affect the growth cycle of plant cells. The purpose of our project was to determine if EMR would negatively living cells, and to determine if the new technology to neutralize it is effective. We grew three plants near a cell phone and away from a phone. We recorded how the EMR from the cell phone affected the growth and coloring of the plants over the 4 week period. Next we tested some of the new technology used to neutralize EMR. We did this by growing the same plants near to a cell phone with the technology and comparing our observations. Is your cell phone a health risk? We decided to find out.