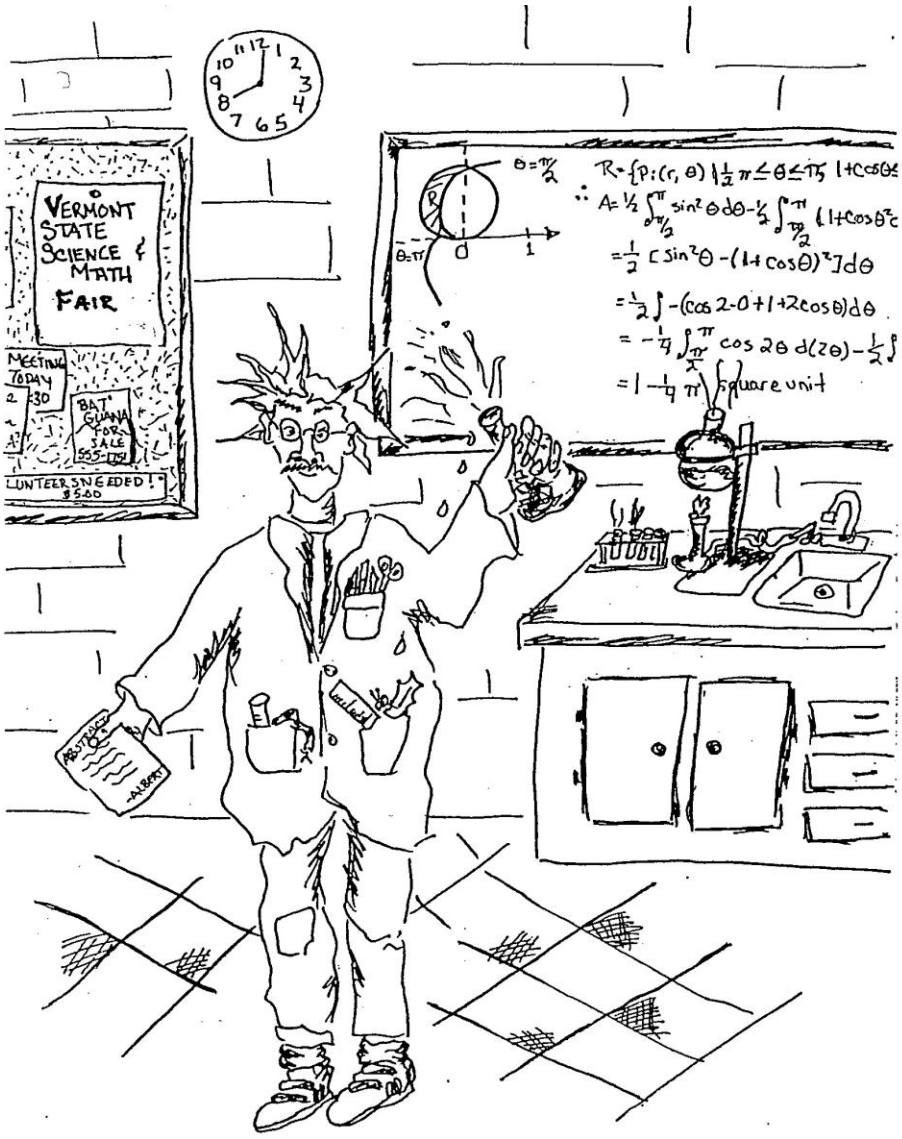
The Vermont State Science & Math Fair

2012 Abstract Book



Norwich University, Northfield Vermont

March 31, 2012

VISION & MISSION

The Vermont State Science & Mathematics Fair (VSSMF) envisions Vermont as a state where an increasing proportion of our secondary students continue their post-secondary education or training in STEM (Science, Technology, Engineering and/or Math), and our youth see the vibrant STEM culture and the promising future in STEM related careers and occupations in Vermont.

Our mission is to inspire and reward Vermont middle or high school students for high quality STEM inquiry by providing free access to competitions for independent student research, STEM scholarships to Vermont colleges, and cash and recognition awards and opportunities worth almost a million dollars through participation in the VSSMF.

INTRODUCTION

We believe conducting and presenting independent research prepares middle and high school students for post secondary education or training, and lifelong learning in STEM. The Scientific Methods empower students to innovate, solve problems and make discoveries that will impact the future. A crucial part of this process is the evaluation of their work by established scientists in the field using standards-based scoring rubrics. In this way the VSSMF contributes to the overall educational experience of the student.

The VSSMF annual inquiry based poster-presentation competition is an exciting opportunity for aspiring scientists and engineers (grades 5-12), and their teachers to showcase the results of their independent research. Each year 200 student projects, selected from over 2000 projects statewide, address questions and solve problems in all areas of STEM.

Students compete for more than $8000 in cash and prizes, $13,000 in trip awards and expenses donated by local organizations, and $900,000 in scholarships to Vermont colleges. The fair is also affiliated with the International Science and Engineering Fair, and five other national and international competitions, which award additional prizes.

Projects are judged by at least three Judges, separately, over the course of the morning to determine winners for medals, cash, trips and scholarships. Our approximately 150 Judges include industry scientists and engineers, secondary education faculty, medical professionals, military personnel and retirees, and other science related professionals from across Vermont who hold advanced degrees, have extensive experience, or both in the STEM disciplines.

The VSSMF, sponsored by the VPA, is an all-volunteer, non-profit [501(c)(3)] education organization supported by Norwich University and around 100 other Vermont organizations, colleges and industry partners.

Map of Norwich University

Schedule

7:45 - 9:00	**Registration**, Lobby of Science Building & project set up in assigned rooms
9:00 - 12:30	**Judging of projects** - Projects open to public
10:00 - 10:30	**Mid-morning break** - Students may visit exhibits
12:30 - 2:00	**Lunch**, Wise Campus Center Food Court & Take down projects
2:00 - 4:00	**Program & Awards**, Dole Auditorium, Webb Hall

10:00 - 1:30 **University and Museum Exhibits**, 2nd floor Lobby, Wise Campus Center and Lobby of the Sullivan Museum and History Center

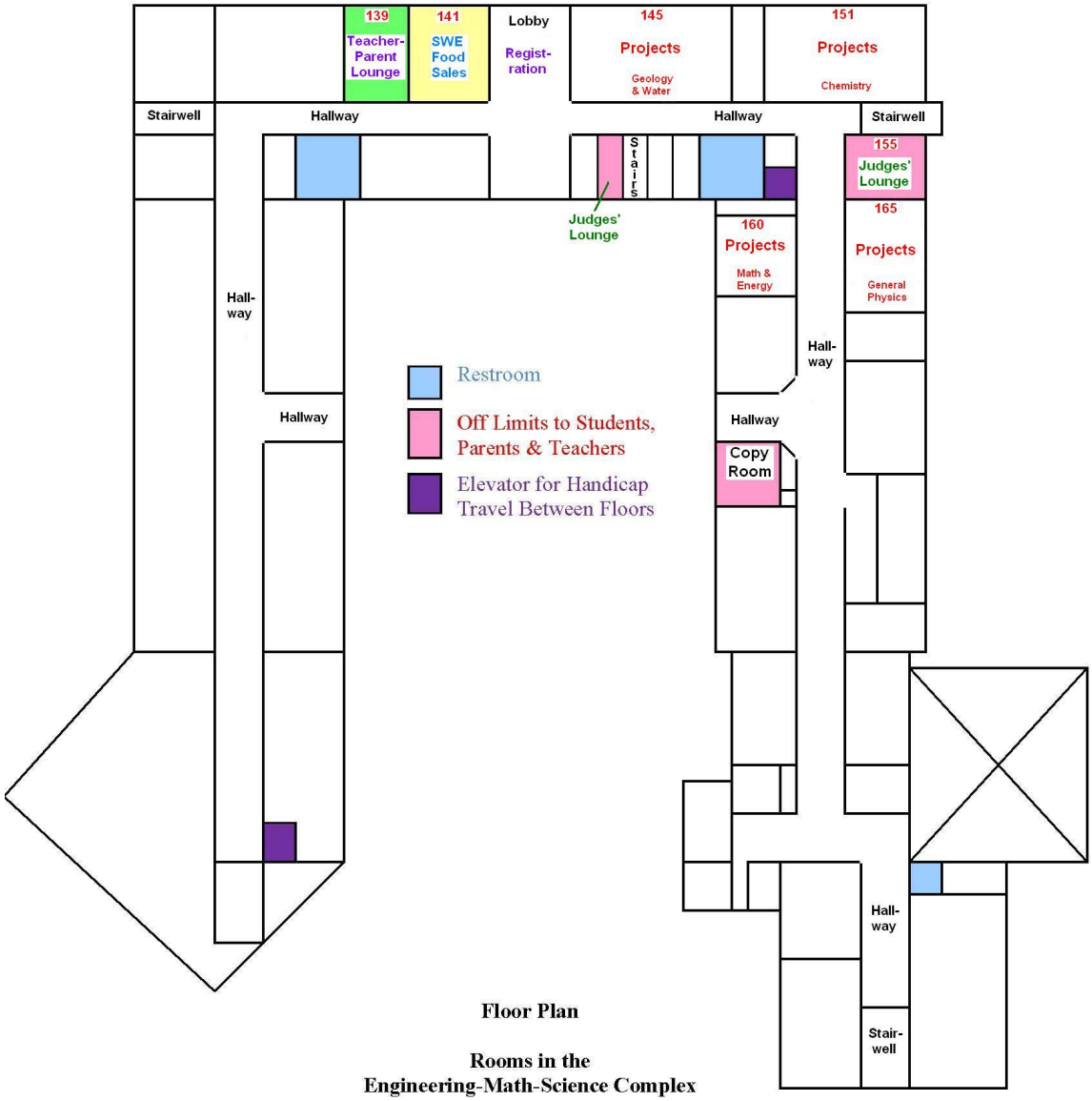
Room Assignments

Room	Project Numbers	Topic area
145	P31-P41 & GP08-GP09	Physics/GP
151	P01-P30	Physics
165	M01-M06 & G01-G09	Math & Geology
235	S01-S18 & GP10	Social Science/GP
239	C01-C21 & GP07	Chemistry/GP
243	B01-B40 bio	
267	B41-B60 & GP01-GP06	Biology/GP

Lounges

141	SWE Food Sales
139, 271	Teacher-Parent Lounges
155, 251, 275	Judges Lounges

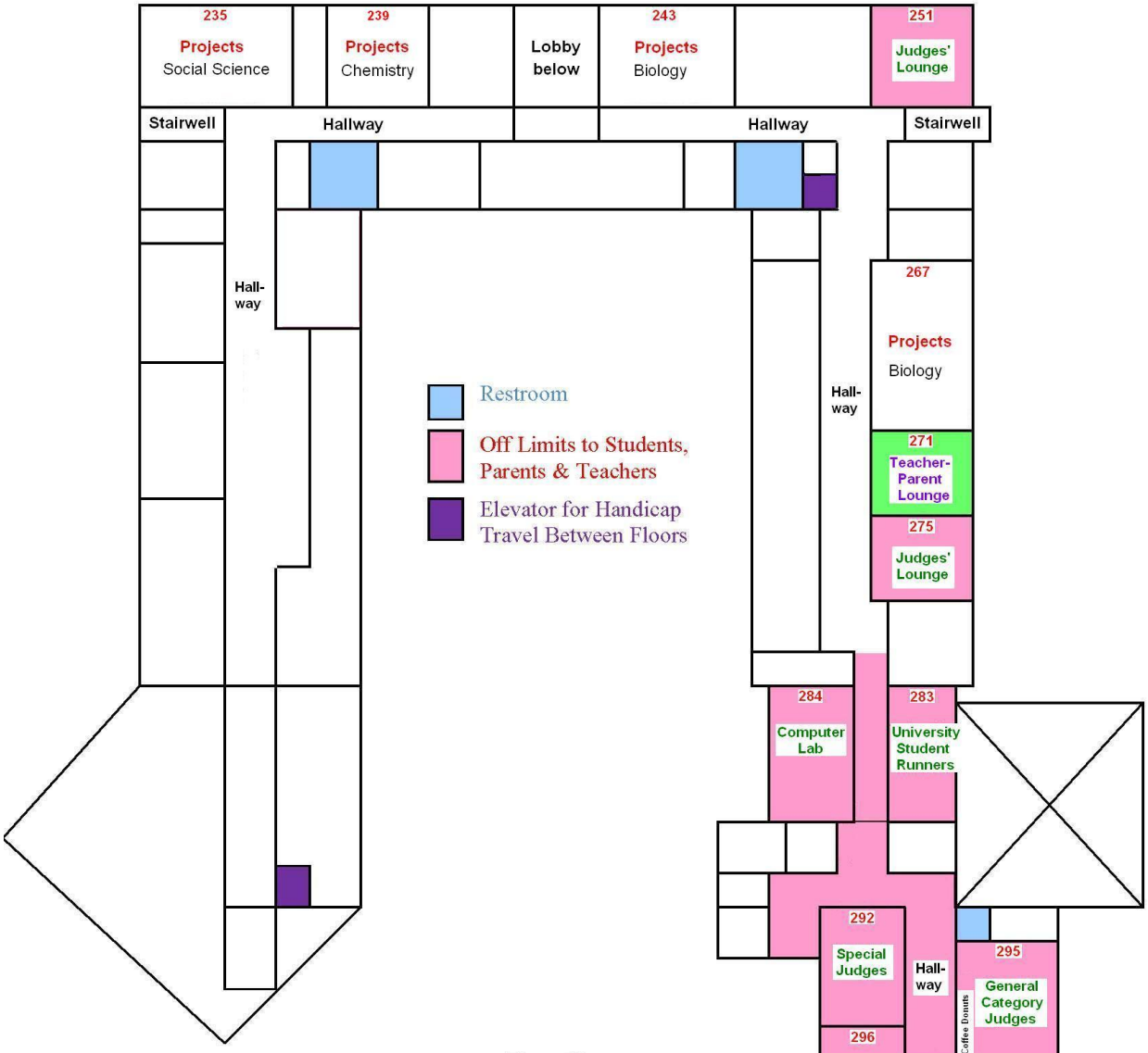
It is inappropriate to eat in the science labs. Please limit food consumption to the lounges. Only bottled water is allowed in the project rooms. Thank you.



Floor Plan

Rooms in the
Engineering-Math-Science Complex
Used in the VSSMF

First Floor



Floor Plan

Rooms in the
Engineering-Math-Science Complex
Used in the VSSMF

Second Floor

NAME(s) Ahmet Akgul

PROJECT NUMBER B02

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Subliminal Messaging**

ABSTRACT

The purpose of this project is to test the effectiveness of subliminal messages in humans. In 1957, James Vicary claimed to find dramatic increases in the sales of Coca-Cola and popcorn when he flashed the phrases "Drink Coca-Cola" and "Eat popcorn" for 1/2000 of a second during a movie. To test the test subjects, two-minute long memory videos were made. Test subjects were told that a short memory test would be conducted, and that we needed their voluntary participation. The videos consisted of a total of 20 words. There were two different videos made. One of them had the subliminal message æChoose WhiteÆ in between each word, while the other had no subliminal messages. The subliminal messages were flashed at 7/100thæs of a second. A total of 50 people were tested. Each video was watched by 25 test subjects. After watching the video, each test subject filled out a survey to follow along with the memory test. Then, they were given the choice of taking a Hershey Kiss either out of a Red bowl or a White bowl. After the test, they were informed that they had actually been tested with subliminal messages. To support my hypothesis, the amount of people who took the test with subliminal messages who chose Hershey Kiss from the White bowl would have to be significantly higher than the amount of people who took the test without subliminal messages who chose Hershey Kiss from the White Bowl. I believe that my hypothesis will be correct.

NAME(s) Deema AL Namee

PROJECT NUMBER B01

SCHOOL South Burlington High School

GRADE 9

TEACHER Curtis Belton

PROJECT TITLE **Minimizing Bacteria in Thawing Of Meats**

ABSTRACT

What thawing method produces the lowest amount of bacteria in meats? Does chicken or ground beef get affected more?

○The Procedure is to chicken and ground beef then thaw them with three different methods. The three different methods are Cold-water thawing, Microwave thawing, and Refrigerator thawing. The plates were left for 24 hours to grow bacterial colonies. Three to four dilutions were made to make the bacterial colonies easier to see with the naked eye. With the tests that have been done chicken has been getting the first place with having the most bacteria, and then comes the ground beef with way fewer amounts. Three to four dilutions needed to be done for the chicken but not for the ground beef. From the data that has been done, we can conclude that chicken has way more bacterial colonies, and it needs extra care when being thawed or cooked. Therefore ground beef is easier to thaw and has less bacterial colonies.

NAME(s) Ian Albee

PROJECT NUMBER B03

SCHOOL Northfield Middle High School

GRADE 11

TEACHER Cynthia Tomczyk

PROJECT TITLE **The Effect of Heat on the Chirping Frequency of Acheta Domestica**

ABSTRACT

Crickets are classified as singing insects for the unique sound that occurs whenever males of the species rub their wings together in order to attract a mate. An urban legend suggests that increasing the temperature of the crickets Æ environment can increase the frequency at which the crickets chirp. This experiment tested whether an outside force, in this case heat, can actually alter the rate at which the crickets chirp. A terrarium full of both male and female crickets was used as the main housing for the duration of the test, with the heat being introduced from the terrarium Æs screened rooftop. After five minutes of exposure to the heat, one minute of recording data would commence, followed by a further five minutes to cool down from the exposure, with these three steps repeated for each individual test three times for the experiment. The heat settings were the control (21.1 degrees Celsius), with heat lamp on (24.26 degrees Celsius), with heat light on (29.26 degrees Celsius), and with both heating devices on (32.41 degrees Celsius). The average number of chirps were 89 chirps for control, 96 chirps for heat lamp, 85 chirps for heat light, and 123 chirps for both heating devices. It was found that heat directly affects the chirp rate by increasing the frequency with the temperature; the higher the temperature, the more frequent the chirps. Ultimately, it was found that while some determining factors have a higher likelihood of affecting the chirp rate of the cricket or crickets than other factors, the cricket is a living being that chooses to chirp or not to chirp in order to attract or woo a mate. When the cricket or crickets do choose to chirp, however, it was noted that heat will increase the chirping frequency directly with the number of degrees.

NAME(s) Shannon Alexander

PROJECT NUMBER C01

SCHOOL Rutland High School

GRADE 11

TEACHER Debra Hathaway

PROJECT TITLE **Dawn to the Rescue**

ABSTRACT

The purpose of this experiment is to find out how much oil was in the soil in a backyard, after 200 gallons of oil, mixed with water was dumped there 2 days after hurricane Irene. After different methods and ideas, the logical way to approach this experiment, was to place Dawn dish liquid which breaks down oil and gets rid of it, into each soil sample until the soil was covered and let it sit for a few days so that the soap could properly get rid of the oil. The results did not come out as planned, the soap did not take much or any oil away from the soil. The masses of the beaker and soil before the soap was lower then it was after the soil was treated and dried. So, taking that into consideration, some of the soap was not washed out when it was being rinsed according to the masses from untreated and dried, to treated and dried. Also, the size of the beakers were not big which could have made the results differ because the sample was so small, and there was only 4 samples for each location that samples were taken. The ending masses were surprising and it is suspected the dawn was not completely removed from the soil.

NAME(s) Sabrina Allain, Keagan McNamara
PROJECT NUMBER GP10
SCHOOL Avalon Triumvirate Academy
GRADE 10
TEACHER Amanda Gifford
PROJECT TITLE **Sleep Deprivation**

ABSTRACT

Sleep deprivation causes weight loss or gain, aching muscles, depression, hallucination, blood shot eyes and temper tantrums (if a child). 25% of Americans experience occasional sleep deprivation. Some types of sleep disorders are: Insomnia, Night terrors, Restless leg syndrome, sleep apnea, Snoring, Teeth grinding, and Sleep walking. Eight hours is the correct amount of sleep for an average person. It is hypothesized that the less sleep you get, the worse score you will achieve on the tests. Many subjects were tested on math and memory skills. There were three sets of math tests with 100 simple addition questions, three sets of Simon Says Electronic Ö games, and three sets of card memorization in which the test subjects had to recall the six card sequence. It was identified that the amount of sleep the subjects got did affect their test scores to some degree. Subjects were interviewed for indicators of sleep deprivation which includes the amount of sleep received the previous night, subjects were not asked to deprive themselves of sleep in this study. They were tested and the scores were recorded. In conclusion there was no definitive answer to the hypothesis because sleep deprivation affected the subjects differently. Asking subjects to get the same amount of sleep for each round of testing would improve the accuracy of the test.

NAME(s) Brittany Alvarez
PROJECT NUMBER B04
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar
PROJECT TITLE **Winning By a Neck**

ABSTRACT

A horse with a ground-covering stride is crucial to a riderÆs success in the show ring. Every rider needs a nearly foolproof, inexpensive way to determine if a future partner has this quality. Using the horses at my own barn, I tested and made the hypothesis that the length of a horseÆs neck directly influences the length of its strides. Each horseÆs neck was measured, and a section of the indoor arena, the testing distance, was measured (1585 centimeters) and marked offAs each horse was ridden across the distance, I counted the number of strides it took the horse to cover it for three trials, and the average of these were divided into 1585 centimeters to determine the horseÆs average stride length. . I intended to have only one independent variable: the neck lengths. The following factors were kept constant in order to avoid unwanted variables: position of horsesÆ necks when measured, amount of weight carried by each horse, direction of travel, and height of horses.

The horse with the smallest neck, 82.8 centimeters, had average stride lengths of 97.2, 191, and 165.1 centimeters for the walk, trot, and canter, respectfully. The horse with the longest neck, 101.5 centimeters, had average stride lengths of 135.5, 191, and 217.1 centimeters for the walk, trot, and canter, respectfully. These results show that stride length does increase with neck length. Also, two horses with drastically different lengths in their necks also had much more apparent differences in the lengths of their stride, though a smaller difference would barely be noticeable by a judge. Because of this, I concluded that, although measuring a horseÆs neck can be a great way to determine how long its strides will be, unless two horses have drastically different length necks, their strides will barely differ in length

NAME(s) **Emily Andrulat**

PROJECT NUMBER **B05**

SCHOOL Rutland High School

GRADE 11

TEACHER Ann Marie Mahar

PROJECT TITLE **Soak Up the Sun? How UV Light Affects Cellular Growth**

ABSTRACT

The purpose of completing this science project was to test sunscreen in order to determine the sunscreen that protected human skin the best. In order to determine the level of protection, E. coli colonies were counted and compared to the control. I wanted to find out if a sunscreen with an SPF of 70 offered more protection than a sunscreen with an SPF of 30. I used E.coli to simulate human skin cells.

- The medium that I used to grow the E. coli on was nutrient broth Agar. After the E. coli incubated in the incubator for 5 days, I brought the Petri dishes to a tanning salon. I placed a towel in the bottom of the tanning bed and then arranged the Petri dishes on it. I turned the tanning bed on and closed it. The bed was a medium pressure bed and the Petri dishes were in there for 20 minutes. After the exposure to the tanning bed, I put the Petri dishes back in the incubator for 36 hours. Some key variables in my experiment were the different sunscreens. I chose the SPF 30 and SPF 70 because I wanted to find out if SPF 70 was really that much more effective.
- From my experiment, I discovered that wearing sunscreen is better than not wearing any, and wearing SPF 70 is more effective than wearing SPF 30. After counting the bacteria from the SPF 70 Petri dishes, I found that 227.27% of the bacteria survived and 136.36% of the bacteria from the SPF 30 Petri dishes survived.
- The findings of this experiment will hopefully encourage more people to use sunscreen and possibly think twice before tanning. I believe I was successful in meeting my goal of discovering which sunscreen was better.

NAME(s) **Mrinal Asthana**

PROJECT NUMBER **B06**

SCHOOL South Burlington High School

GRADE 9

TEACHER Curtis R. Belton

PROJECT TITLE **Optimizing Bioremediation**

ABSTRACT

In this experiment, several types of absorbers will be tested on different types of oils to evaluate which absorber works best with which kind of oil.I will be looking at Synthetic Organic absorbents as they are more common material and easier to obtain. The control in this experiment will be water, preferably cold salt water. The experimental group will be the oil. I will be taking vegetable oil and cocoa powder to resemble oil behaviorally and visually. This will be testing the effectiveness of various Synthetic Organic absorbents and trying to figure out how to better their performance. This is a very simple representation of a series of experiments likely to be done. Data likely to be acquired from these experiments in the near future will show amount of time required, and how much of oil actually is soaked up by absorbent. Conclusions to this experiment would be pairing up absorbents and liquids, and efficiency of different types of absorbents.

NAME(s) Jordan Ayer

PROJECT NUMBER S01

SCHOOL Hinesburg Community School

GRADE 8

TEACHER Stephanie Konowitz

PROJECT TITLE **The Dangers of Texting**

ABSTRACT

I am interested in keeping people safe on the roads so I wanted to know if texting while driving affects a personÆs ability to drive safely. When texting and driving a person will spend only 1.4 out of 6 six seconds paying attention to the road and will spend 4.6 seconds with full attention towards their phone. In order to conduct my experiment I had subjects come in and do 6 trials. The first three trials were testing the persons driving ability overall, the next three trials were done while implementing texting into the driving environment this was done using a driving simulation game. In the end I came to the conclusion that texting while driving has a negative impact on your driving ability crashes increased by almost two times.

NAME(s) Sean Babcock

PROJECT NUMBER M01

SCHOOL Rutland High School

GRADE 10

TEACHER Dawn Adams

PROJECT TITLE **Computer Power Usage**

ABSTRACT

Saving money and the environment are two crucial issues in today's world that sometimes do not go together. Computers are a huge part of the business world, and if used effectively, workers can balance saving time, money, and power. My project looks at how the level of computer workload correlates with the use of power. I did multiple tests that simulated a high computer workload that ran a high graphical processing unit (GPU) setting, a high computer workload with a normal central processing unit (CPU) setting, an average computer workload, the computer idling, sleeping, and off. For each of these categories, I recorded the levels of computer usage (Gigabytes of RAM and percent of CPU) and the number of watts the computer was using at the given time. Each level of computer workload had twenty recorded watt readings that were averaged. I hypothesized that the higher the computer workload was, the higher the power usage would be, and I was correct. I found out that people wishing to find a balance between saving time and energy should sleep their computer rather than turn it off or let it idle because it only uses approximately one more watt than the computer being off. Letting the computer idle for a whole year would end up costing around $160 versus the approximate $4 that it costs to let it sleep for a year. Using my collected data and the current cost of electricity per kilowatt hour, it is simple to estimate theoretical situations of mass computer usage as a way to cut costs while maintaining efficiency.

NAME(s) Matt Baechle
PROJECT NUMBER B07
SCHOOL South Burlington High School
GRADE 10
TEACHER Curt Belton

PROJECT TITLE **SODIS Water Disinfection**

ABSTRACT

The purpose of this experiment is too determine what material underneath your bottles will stimulate the most bacteria killed, using the SODIS method. For this lab one PET plastic bottle will be placed on top of either grass, dirt, hay, wood, and sheet metal as the control. The bottles will lay in the sun for six hours and after the water out of each bottle will be mainly tested for ecoli levels along with pH, phosphorus, and nitrates along with other common water quality tests. UV rays from the sun kill bacteria that is why ecoli is the main test. To support my hypothesis the sun would have to kill the most bacteria (ecoli) in the bottle placed under the sheet metal. Sheet metal is hypothesized to kill the most bacteria because it is reflective possibly harnessing in more UV rays than other materials. In conclusion, using the SODIS method to kill bacteria the bottle under sheet metal should kill the most bacteria.

NAME(s) Jack Barron
PROJECT NUMBER B08
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **The Practicality of Bottled Water**

ABSTRACT

My lab consists of two sections, a human taste test, and several water testing kits to calculate water quality index. This project will benefit society because it will open peopleÆs eyes to bottled water and how unnecessary it is.

In the human tests, a student at South Burlington High School will be given four four ounce servings of water. The first two will be bottled waters from Poland Springs and Dasani. The second three will be clean tap water from South Burlington and Montpelier. The subject will then be asked to group the water based on taste. This has to be done for many students, approximately fifty which should give me a good estimate about whether or not the water is distinguishable by taste and if so, which brands were best and which were worst. Preliminary data shows that there is a slight trend towards bottled waterÆs tasting better but in general there is no clear cut best or worst sample.

The second part of the lab is finding the water quality index of the four water samples. The water quality index consists of nine factors: Dissolved Oxygen, Fecal Coliform, Nitrates, pH, Temperature Change, Total Dissolved Solids, Total Phosphate, Turbidity, and Biochemical Oxygen Demand. Preliminary data suggests that the bottled waters from Poland Springs and Dasani have a slightly better water quality index, but nothing substantial. South BurlingtonÆs water quality index is also slightly better than MontpelierÆs.

NAME(s) **Justin Beaudoin**

PROJECT NUMBER **P01**

SCHOOL St. Francis Xavier School

GRADE 8

TEACHER Mary Ellen Varhue

PROJECT TITLE **Son of the Sun**

ABSTRACT

My project investigated the effect of cloud cover on solar panel performance. I hypothesized that the cloud cover would not make a difference in any major degree, but that 0% cloud cover would do best. A cloud cover is not the same as if it's dark and cold.

I used a 4.50 watt solar cell to test my hypothesis. I tested 10 days for each of the three locations. I used the same cell in every place. I tried to keep the cell the same temperature. At noon each day I wrote down the cloud cover (to my best judgment) then I used a multimeter to measure the voltage output of the solar panel.

○My results showed that 25%- 50% cloud cover gave the highest voltage for my solar panel. This was surprising. Many people say that solar panels work better in places like the desert because there is more sun and fewer clouds. I have two reasons why this might be best at 25%-50% cloud cover. The first and most likely is that the light hits the earth, bounces back up to the clouds, then bounces back down to the earth. That is the one that I find most probable. My second theory is that the sun hits the water in the clouds, breaks up in to many pieces, and scatters so that the sun directly hits the panel and also indirectly hits the panel. My results lead to several new questions that I would like to investigate further.

NAME(s) **Emma Bell**

PROJECT NUMBER **B09**

SCHOOL Grand Isle School

GRADE 6

TEACHER Paul Sacca

PROJECT TITLE **Comparison of bacteria: Human vs Canine**

ABSTRACT

Hypothesis: I had always heard that a dog's mouth was cleaner than a human's. I wanted to see if that was true. I thought that canine mouths would have fewer bacteria than human mouths.

Procedure: I took samples from the mouths of 3 dogs and 3 humans and then swabbed the samples onto agar plates. I made an incubator from a cooler and light. I grew the samples between 35 and 37 degrees Celsius and checked them each day. After seven days, I compared the amount of growth and different types of growth on each plate.

Results: All of the plates had some growth after seven days. The samples from the canine mouths had much more growth than the human samples. There were also more different types of growth on the canine samples.

Conclusions: In my experiment, the canine mouths had more bacteria and more types of bacteria than the human mouths. I was wrong about the amount of bacteria in human and canine mouths.

NAME(s) **Kristina Bennett**

PROJECT NUMBER **B10**

SCHOOL Northfield Middle High School

GRADE 11

TEACHER Cynthia Tomczyk

PROJECT TITLE **The Effect of Varying pH on Bacterial Growth**

ABSTRACT

The purpose of this experiment was to find how the pH of the environment bacteria was grown in would affect its growth. I hypothesized that as the pH got farther away from a neutral pH, there would be less bacterial growth. The experiment involved hole punching filter paper and then soaking these chads (paper fragments created when holes are punched in paper) with solutions of different pHs. Those were then placed on petri dishes that were inoculated with bacteria and incubated for twelve hours. Then chads that were soaked in pHs that inhibited bacterial growth had a zone that had no bacteria surrounding it, and the average distance from the chad to the bacterial growth was calculated. The bacterial growth was, on average, 5.5 millimeters away from a chad with a pH of two, 1.7 millimeters from a chad with a pH of three, 0.5 millimeters away from a chad with a pH of five, and 0.0 millimeters from a chad with a pH of seven. The bacterial growth was, on average, 0.5 millimeters away from a chad with a pH of eight, 6.2 millimeters from a chad with pH of eleven, 7.9 millimeters away from a chad with a pH of twelve, and 9.1 millimeters from a chad with a pH of fourteen. This data shows that as pHs get farther away from a neutral pH more bacterial growth was inhibited. The pHs that were closer to a neutral pH, for example five and eight, did not inhibit bacterial growth as efficiently. Acidic pHs inhibited bacterial growth, however, not as efficiently as alkaline pHs.

NAME(s) **Ronak Bhagat**

PROJECT NUMBER **B11**

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Leaching Water Bottles**

ABSTRACT

○New discoveries have been made in recant years about leaching chemicals from water bottle plastics. The purpose of my experiment is to see whether artificial lighting has an effect on chemical leaching in water bottles. I hypothesize that the bottles placed under natural ambient lights will leach a greater amount compared to the set of water bottles under artificial lights. First, various plastic bottles that we use on a daily basis were collected. Plastic water bottles were then filled up with distilled water and placed under different lighting. The control set of bottles were kept in a greenhouse, while the treatment group were placed under artificial lights. The water was then tested for ion content, pH and conductivity after 12 days. Preliminary data shows a low conductivity, meaning little to no leaching has occurred in the control group.

NAME(s) **Jonah Bissell**

PROJECT NUMBER **P02**

SCHOOL Rutland High School

GRADE 11

TEACHER Dawn Adams

PROJECT TITLE **"How High?"**

ABSTRACT

This æprojectÆ started with curiosity and ended with closure. I didnÆt see this as a mandatory assignment but as an opportunity for my curiosity to be quenched. I am a skateboarder. I have a passion for skateboarding. Through my developed consciousness of a certain occurrence, I was able to come up with a clear question; a question that screamed for an answer: ôWhy is it harder to æpopÆ when the ground is colder?ö (The term æpopÆ in this context refers to an ollie, a maneuver in which the tail of a skateboard hits the ground, propelling the skateboarder into the air.) This question existed far before I even knew about the science fair and when the fair finally came along, I knew exactly what to do; I wanted to answer my question! After 75 ollies on a relatively warm surface (8.33-8.89 Degrees Celsius) and 40 ollies on a relatively cold surface (-4.44 to û2.78 Degrees Celsius), the distance between the solution and I, decreased. Statistic after statistic lead to complete neurological drainage but, ultimately, to an answer: the temperature of a surface has no effect on the height (efficiency of the æpopÆ) of an ollie on a skateboard! Although it sounds like a let down, I had my answer. I received what I desperately desired! Because of the presence of so many variables, results can be collected but not explained. Whatever judgment I receive, whatever grade I get, my curiosity was quenched and thatÆs all that matters.

NAME(s) **Ben Blackmore**

PROJECT NUMBER **S02**

SCHOOL The Renaissance School

GRADE 5

TEACHER Eve R. S. Dubois

PROJECT TITLE **Renewable Vermont**

ABSTRACT

I investigated renewable energies for the science fair. I know many smart scientists are working on renewable energies, and there are many advantages and disadvantages to each type of renewable energy. There are many ways to test which energy is better, but I think in the end, which is better really depends on opinion.

To test my project, I decided to narrow the scope so that my question was what do people think is the best renewable energy for Vermont, not the country or the world.

I think that manure digesters would be best for Vermont because Vermont has a lot of dairy farms, and lots and lots of cows! Also, methane power would support local farmers, rather than industrial. Another fact that I like about methane power is that it never wastes: there is a cycle: first, the cows eat grass, then they make manure, then it is turned to energy, and the waste is used as fertilizer, which makes grass grow, and the cycle is repeated. I think wind power will get many votes. I like wind power because the direct wind through the Vermont mountains would make wind power very convenient, but I think methane would be the best choice.

To test my project, I took several volunteers and presented common advantages and disadvantages to each problem, and how they would work and not work in Vermont, and took each person's vote on a paper so confidentiality could be maintained. After the votes were written, I counted votes and determined my results.

I found that people had my thinking! Methane got voted number one. Solar and wind tied for number two. I also like solar power because it is simple to acquire and a power anyone could have, and like wind, has an unlimited resource.

NAME(s) **Ellery Bock**

PROJECT NUMBER **S03**

SCHOOL Folsom Community Educational Center

GRADE 7

TEACHER Paul Fitzgerald

PROJECT TITLE **PBIS and the Star System**

ABSTRACT

My project studies PBIS from the point of view of the students and the star system effectiveness. To find out, I made an online survey and had the 5th through 8th grade take the survey once a month in December, January, and February. I was also going to personally observe my teachers and classmates and look at the SWIS Big Five for these months. Both my survey and my observations showed that kids did not feel that most students , but it was slowly starting to work. The small things like bringing a planner to class and writing down homework did improve. SWIS shows that February had the least amount of referrals per day during PBIS. This means that it did help. It went from 1.3 in September, to 0.8 in February. This is good and I would like to follow this throughout the year to see if it was chance or actually PBIS. My teachers pointed out that kids do not like to be manipulated and that is what PBIS and the star system does to improve behavior. These small things make a difference and since it was through PBIS, I concluded for that PBIS did have positive impact here. Further confusing me, I got so much mixed reactions from kids when I interviewed them in February about how much their attitudes towards the Star System, that there is no way to make a conclusion about my hypothesis. Part of my hypothesis and site visit notes was that PBIS will take at least three years to start to make a significant impact and I did prove that it wasn't immediate. In conclusion, I did prove that it wouldn't make a relevant difference in three months. As a further study, I could study the affects of PBIS over older or younger students or specificly focus on behavior to get more data.

NAME(s) **Andrea Boe**

PROJECT NUMBER **P03**

SCHOOL St. Mary's School - Middlebury

GRADE 6

TEACHER Michelle Eagan

PROJECT TITLE **Attraction & Repulsion**

ABSTRACT

Are you attracted to magnets? Everything that moves has a force behind it. Magnetic forces are everywhere in your everyday life and activities and most people donÆt even realize their importance. Through my experiment I was able to find what gives a magnet the strength to push, pull, and lift an object from a short distance away. I tested to figure out which objects are magnetic and what makes an object magnetic. Magnets have different strengths and I learned what affects the strength of a magnet by testing the pull of a magnet through water and paper. To determine which objects are magnetic I gathered random objects and five magnets and tested each object for magnetism. If the object was influenced by the magnet then the object was magnetic. I tried to make it harder for the magnet to pull the object by putting the object in water and making the magnet attract the object through the water. I made the magnet pull through paper as well. Paper made it harder for the magnet to lift the object but the magnetÆs strength did not change through water. After I completed my experiment I realized that not all metal objects are magnetic! I did research to understand why this was true and learned that only four elements have magnetic properties: iron, nickel, cobalt, and some rare earth elements. My experiment clarified a common misunderstanding that all metals are attracted to magnets. I succeeded in my scientific goal of determining which objects are magnetic and what affects the strength of a magnet.

NAME(s) **Alexis Boyd, Jocelyn Lawrence** PROJECT NUMBER **GP01**

SCHOOL Avalon Triumvirate Academy GRADE **8**

TEACHER Amanda Gifford

PROJECT TITLE **Are fingerprints inherited?**

ABSTRACT

Fingerprints were discovered in 1858 by Sir William J. Hershel and have been studied and used ever since. Fingerprints have more recently been used to help identify people in criminal and court cases. No one has the exact same fingerprints as anyone else. Fingerprints have three main patterns; the loop, whorl, and the arch. It thought that the general pattern of fingerprints is inherited through families. To test this, fingerprints of the right thumb were taken with ink. The fingerprint pattern of the individual was recorded and labeled with their relation to family members. It was observed that most subjects have the loop fingerprint pattern. It was also noticed that most family members had similar fingerprint patterns but on a rare occasion they did not have the same fingerprint patterns throughout the family. Therefore, it was concluded that fingerprint patterns are inherited and that there are dominant and recessive alleles in fingerprint genes, with the loop being dominant.

NAME(s) **Christian Brunelle** PROJECT NUMBER **P04**

SCHOOL St. Francis Xavier School GRADE **8**

TEACHER Mary Ellen Varhue

PROJECT TITLE **Got Fabric?**

ABSTRACT

Research Question: Which fabric is the best insulator?
Hypothesis: I think fur will be the best fabric to keep some body warm and I think fleece will come very close to fur.
Materials: You need Fleece, Velour, artificial Fur, Satin, Polyester (Thermal under wear), Denim, Felt, Linen, Spandex, a pocket thermometer with extended probe, water, one gallon plastic milk carton, a drill, and a freezer.

Procedure 1: Drill hole into bottle cap. Cover the gallon container with a fabric (1 layer). Fill the container with 51.0 deg C water. Insert probe, of the thermometer into cap. Place the gallon container into the - 17.8 deg C freezer. Take a temperature reading every hour, until the water reached its lowest point (-0.5 deg C).
Find out which fabric reduces the rate of heat loss the best.

Procedure 2: Cover the gallon container with fleece and another fabric (2 layers). Fill the container with 30.0 deg C water. Insert probe of the thermometer into cap. Place the gallon container into the 0.0 F / -17.8 deg C freezer. Take a temperature reading every hour, until the water reached 0.0 deg C.
Find out which fabric reduces the rate of heat loss the best.

Results/Conclusion: Fur ended up being the best fabric to minimize the rate of heat loss. Fleece came close to Fur. So my hypothesis was right. Most of the other commonly known fabrics, such as Cotton, Polyester, Linen, and Spandex, were less effective in reducing the rate of heat loss. Many of these fabrics are used in combination, for example, 50% Cotton and Polyester.
All fabrics have some heat value; my experiments proved that Fleece and Velour seem to be growing in popularity because of style, warmth, comfort and ease of maintenance.

NAME(s) **Gordon Clark**

PROJECT NUMBER **B12**

SCHOOL Avalon Triumvirate Academy

GRADE 5

TEACHER Amanda Gifford

PROJECT TITLE **Effects of sugar on plant growth**

ABSTRACT

The experiment was to find out if sugar greatly affected the growth of the plant being grown. It is believed that sugar will help plants grow, make them stronger and grow faster. The design of the experiment was very simple to come up with, but growing the plants was more difficult because the conditions had to be right: the time of day, humidity, and simply remembering to water the plants. The materials include applesauce containers for pots, radish seeds for testing, water for food, sugar water for variable, and soil for growing. This experiment was a lot of fun becuase it felt like you were doing science fair every day having water the plants. First: plant the seeds in the applesauce containers, second: water plants with a sugar-water solution and plain water, third: take notes on growth in inches, finally: find an average and compare your hypothesis. The hypothesis was wrong because the plants with sugar water grew a great deal less than the plants with normal water due to the excess amount of sugar. Plants will not have the same growth due to excess sucrose($C_{12}H_{22}O_1$), and build-up of sucrose in the soil. Plants cannot use sucrose, plants use another kind of sugar called glucose.

NAME(s) **Hadley Clark**

PROJECT NUMBER **B13**

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Swim to Breathe**

ABSTRACT

The purpose of this project is to show the impact of competitive swimming on lung capacity in children, and to determine the impact of competitive swimming on non-exercise-induced asthma. The hypothesis was that lung capacity is significantly increased in children who participate in competitive swimming. Further, asthma symptoms in asthmatic swimmers are much reduced. In the study, more than 60 children ages 8-18 were interviewed, including swimmers with and without asthma and a non-swimmer control group. Pulmonary function in these participants was measured using a spirometer to determine forced vital capacity (FVC) or lung capacity. Findings were consistent with the hypothesis, with variations in FVC driven by swim practice frequency and intensity when normalized for age and gender. Most competitive swimmers with asthma reported improved asthma in qualitative interviews and lung capacity in these swimmers was strong relative to non-swimming peers and swimming peers.

NAME(s) **Amanda Clement** PROJECT NUMBER **B14**

SCHOOL Fair Haven Union High School GRADE **10**

TEACHER Mr. Ketcham

PROJECT TITLE **Can Buying Organic Prevent Sickness?**

ABSTRACT

○My projectÆs topic is the growth of bacteria in chicken. I was wondering if the way the chicken was prepared would effect the amount of bacteria it produced. So my question is, Can Buying Organic Prevent Sickness?, considering that organic food is a very common topic lately.

 To answer my question I did tests of three different types of chicken: fresh organic, frozen regular, and fresh regular, in order to see how they compared. My hypothesis was that the regular frozen chicken would produce the least amount of bacteria, followed by the regular fresh chicken, and then the organic fresh chicken.

 I tested the chicken by placing the different types in labeled disinfected jars, soaking each sample in disinfected water, and swabbing the contents of each jar onto labeled Petri dishes. I then let the dishes sit for five day, took observations each day, and counted the number of bacteria colonies on the last day.

On the last day I found that my hypothesis was half wrong, the fresh organic chicken did not produce the most bacteria, but I was also half right because the frozen regular chicken sample did produce the least. I found my results very surprising, because I thought that since regular chicken is dosed with antibiotics it would decrease the amount of bacteria, but actually this probably caused the problem in the first place.

NAME(s) **Eliana Cohen** PROJECT NUMBER **B16**

SCHOOL South Burlington HIgh School GRADE **10**

TEACHER Curtis Belton

PROJECT TITLE **The Accumulation of Bacteria on Cloth Wrist Bands**

ABSTRACT

The purpose of my experiment is to find out if cloth bracelets contain bacteria, and if so, how fast it accumulates, and how much bacteria there is, if any. The idea for this lab is based in part on other studies of bacterial accumulation on objects such as purses and ties.

The procedure I am using to do this experiment is as follows:

1.○Make bracelets out of cotton yarn
2.○Distribute bracelets to 24 individuals
3.○Have each individual wear their bracelet continuously
4.○Make up 6 petri dishes that have agar in the bottom
5.○Take a small swab of their bracelet of each individual
(see below for swabbing directions)
i.Take a piece of uncontaminated scotch tape
ii.Form the tape into a circle
iii.Stick one side of the tape to the bracelet
iv.Pull tape back off touching only the inside so as not to contaminate the tape
6.○Stick the tape the same side that touched the bacteria down onto the agar
7.○Incubate the agar
8.○Check for bacteria
9.○Repeat steps 4.-8. One week later to see if bacteria count has increased

My hypothesis for this lab is that bacteria will be found on the bracelets but that there will not be a big different in the bacterial count between the first test and the second tests. Because the experiment is not yet completed there is no data available to analyze at this time.

NAME(s) **Lena Cohen** PROJECT NUMBER **B15**

SCHOOL Rutland High School GRADE 11

TEACHER Ann Marie Mahar

PROJECT TITLE **Fertilizer is Bad**

ABSTRACT

○For my project I tested the effects of different concentrations of fertilizer on water with algae. Fertilizer leaking into fresh water is a huge problem because it causes algae blooms. Fertilizer makes algae grow much faster than it normally would. But when something grows, it eventually must die as well. When algae in ponds and lakes decomposes, it uses up the oxygen in the water, therefore unintentionally depriving the fish, that share the water, of oxygen. I predicted that the more concentrated fertilizer would cause the highest levels of algae to grow, to prove that people must stop dumping so much fertilizer in fresh water. I tested this by putting five different concentrations of fertilizer in five different cups, with a sixth cup to act as a control so it received no fertilizer. All cups had an equal amount of algae which I measured before hand. At the end I filtered out the algae and measured the amount that had grown in water. I performed three trials. At the end of all the trials, the average amount of algae grown in the cup with the highest concentration of fertilizer was 3.20 grams, and the average growth for the cup with no fertilizer was 0.95 grams. Clearly the cups with more fertilizer triggered much more algae growth, and it shows us that it is dangerous if ponds and lakes receive too much algae because then all the other aquatic lives are put in extreme danger.

NAME(s) **Dylan Conboy** PROJECT NUMBER **B17**

SCHOOL Rutland High School GRADE 11

TEACHER Ann Marie Mahar

PROJECT TITLE **Salts and Saliva**

ABSTRACT

More and more health-conscious Americans are coming to realize than an over-consumption of starches can be detrimental to their health. I wanted to find a way to make starchy foods - like potatoes and rice - less of a threat, so I went to the source of all consumption; the mouth. This project examines the effects that different salts and chemicals have on saliva's ability to break down starches. Each of the test subjects supplied some of his/her saliva (spat) onto potato cubes in five different cups. One cup was used as a control, but the other cups were exposed to 0.5 grams of either sodium bicarbonate ($NaHCO_3$), sodium chloride (NaCl), potassium bicarbonate ($KHCO_3$), or potassium chloride (KCl). After visually observing the potatoes blacken and decompose for two days, I surveyed my results and was surprised by what I found. I had hypothesized that NaCl would have the greatest effect on the digestion of starches, but my results proved $KHCO_3$ to be the most effective. Moreover, potassium was more effective than sodium, and bicarbonate was more effective than chlorine. All of the salts implemented in these tests acted as extensions of the electrolytes found in salivary enzymes and therefore amplified the abilities of saliva. This experiment not only shows how we can help our bodies take-on starchy foods, but it also provides a glimpse into potential treatments of carbohydrate intolerance and obesity as a result of high sugar consumption.

NAME(s) Annika Conway
PROJECT NUMBER P05
SCHOOL Rutland High School
GRADE
TEACHER Dawn Adams

PROJECT TITLE **Gettin' into the Spin of Things**

ABSTRACT

This project sought to determine the speed of spins as a function of body position. Different spins have body positions that affect the speed skaters can achieve. This study is relevant to both figure skaters and those who watch figure skating because it helps to explain what is taking place on the ice, and how well skaters perform. It was hypothesized that the scratch spin, where arms and legs are held close to the axis of rotation, would be faster than the camel spin, where they are not. The back spin and the sit spin, with intermediate limb positions would fall between these spins. Five skaters performed four spins for three trials each. The Spins were videotaped, and the number of revolutions was counted. The results supported the hypothesis, with the scratch spin being the fastest spin at 54.12 rotations/ 30 seconds, and the camel spin being the slowest spin at 33.92 rotations/ 30 seconds. It was condoned that body position determines how fast a skater can spin; when arms and legs are farther from the axis of rotation, the spin is slower. This study supports the law of conservation of angular momentum in physics involving centripetal force and the axis of rotation.

NAME(s) Sierra Cooper
PROJECT NUMBER S04
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis R. Belton

PROJECT TITLE **Subliminal Messages**

ABSTRACT

The purpose of this experiment it to find out the effect that subliminal messages have on a person's opinion. My hypothesis is that subliminal messages can change a person's opinion. The source that helped me get this hypothesis is:
Subliminal message. (2005). Retrieved from http://www.sleeplearning.com/html/subliminal_message.htm.

For my procedure, I will get a group of fifty people. I will put them in a room with two jars of M&MÆs. One jar will have orange M&MÆs and the other, brown M&MÆs. They will pick one from either jar. I will count to see how many people picked brown and how many people picked orange. Next, I will compose a video that has subliminal messages in it. The message that this video will be giving people is that orange is neutral and brown is good. I will get the same group of people in the same room about a week later, and show them the video that I made. After the video, I will tell the group to choose an M&M from the brown or orange jar. After they have chosen, I will count the number of people who chose from each jar.

If the number of people who chose brown after seeing my video increased, this would show that the subliminal messages did have an effect on the peopleÆs decision and opinions on that color. This data would prove that my hypothesis was correct.

If this was the data, my conclusion would state that my hypothesis was correct, because it shows that people's opinions changed greatly after watching the messages embedded in the video.

NAME(s) Austin Cozzens
PROJECT NUMBER B18
SCHOOL Rutland High School
GRADE 11
TEACHER Dawn Adams
PROJECT TITLE **Water to Fuel**

ABSTRACT

The purpose of this experiment was to demonstrate how water can be used as a fuel and how efficient the cobalt catalyst is when splitting the water. Today, it is already known that pure energy is produced from the breakage and combustion of hydrogen bonds. Hydrogen cars have already been utilizing this technology. The problem with the hydrogen cars is that they use carbon based fuels to obtain that hydrogen energy thus making it not efficient for the earth. Recent studies at MIT have shown that water can be split into hydrogen and oxygen using a simple and inexpensive salt, cobalt nitrate. What you can do with water is split it into pure hydrogen gas and pure oxygen gas and store those two gasses and then react them back together which produces energy and no emissions. The only problem is capturing that energy because it is so powerful; we would not be able to control it right now. It could be the ultimate fuel and save our race.

○To split the water, one had to run an electrical current through it and add the cobalt nitrate. A black film would start to form on the nickel electrode and one would to see oxygen bubbles forming on that positive electrode. Hydrogen gas would form on the negative electrode. What was found is that the less amount of cobalt nitrate put in at a time, the more oxygen bubbles one will get, although the voltage will not be the lowest.

NAME(s) Renee Cruise
PROJECT NUMBER B19
SCHOOL Rutland High School
GRADE 11
TEACHER Dawn Adams
PROJECT TITLE **The Curliest Curl**

ABSTRACT

○With so many hair care products out there, especially curl enhancers, which one provides the best results? This experiment tested this by comparing hair gel and mousse to see which made the tighter, curlier curl. It was hypothesized that, if TRESemmeÆs Flawless Curls Defining Gel and Extra Hold Mousse hair products are used on hair, then TRESemmeÆs Flawless Curls Extra Hold Mousse will produce smaller curls because the protein enriched formula will allow for more disulfide bonds creating curlier curls than the gel would. To test this, hair was washed with TRESemmeÆs Clean and Natural Shampoo and Conditioner. It was then dried and the curl length was measured (with only water in the hair, this will be the control). The hair was washed again and mousse was placed in the hair. It was then dried and the curl length was measured. The hair was washed a third time to test the length with hair gel. These steps make up one trial. Fifteen trials were completed in order to get an accurate set of data. The average curl lengths from the three tests were then found. With mousse it was 5.74cm, with gel it was 8.02cm and without any product (the control) it was 9.39cm. As hypothesized, the mousse had worked the best out of the two different products. As the data revealed, the smallest average was produced by the mousse meaning the curls had been the tightest and therefore the curliest!

NAME(s) **Carolyn Cutting** PROJECT NUMBER **S05**

SCHOOL Mater Christi School GRADE 7

TEACHER Mark Pendergrass

PROJECT TITLE **Memorizing Primary Colors**

ABSTRACT

The purpose of this experiment was to determine if text color affects a personÆs memory. The hypothesis for this project was, ôIf people use red text to study or for memorizing then they will do better on a test than people using other text colorsö.

Research on this project was done to learn about memory. There have been other tests similar to this that showed that red helps peopleÆs
memory.

To test this project, fifteen people participated as testers. The text colors were the primary colors; red, yellow, and blue. First the testers were given a study guide with fifteen words in black text. The testers had three minutes to study this list. After the three minutes, the study guide was taken away and the testers were given a test with the numbers one through fifteen. The test was to write down as many of the words from the study guide the testers could memorize. The same procedure was repeated with colored text. Five students received a red study guide, five received a blue study guide, and the other five students received a yellow study guide.

The results of this test showed that people who studied the red text had the highest average of correct words. The hypothesis for this experiment was correct. Based on the information gathered students should try studying with red text.

NAME(s) **Kevin Dalglish** PROJECT NUMBER **C02**

SCHOOL Rutland High Scool GRADE 11

TEACHER Jody Sabataso

PROJECT TITLE **Bounce Height of Penn**

ABSTRACT

This science experiment was to see how changing the temperature of a tennis ball affects the bounce. The hypothesis was if a tennis ball were cooled down, it would bounce less, and if it were heated it would have a higher bounce. This is important because if you are an avid tennis player, you should know what temperature to keep your balls at for maximum bounce. When the tennis balls were heated the bounced 7.3 cm higher than room temperature. When the balls were cooled they bounced 54.3 cm lower. This experiment proved the hypothesis correct, if you warm a tennis ball up it will bounce higher and if you cool it down it will bounce a lot lower.

NAME(s) **Amber DeBartolo**

PROJECT NUMBER **C03**

SCHOOL Weathersfield School

GRADE 8

TEACHER David E. Lambert

PROJECT TITLE **Do Chemicals Affect the Rate of Water Evaporation?**

ABSTRACT

The problem studied is whether or not chemicals change the rate of water evaporation. I chose to do this project because I was curious about which chemicals changed evaporation rate.

Before I made my hypothesis, I looked up information about it, and found out that adding any chemical to water will slow down its evaporation, because the chemical makes the surface not entirely water. My hypothesis was that salt would slow down the evaporation the most, then sugar, then bleach, and then peroxide.

To do my experiment, I took twenty cups, and filled five with water, five with water and salt, five with water and sugar, five with water and peroxide, and five with water and bleach, and massed them. Then I let them evaporate for 48 hours, and massed them again.

My hypothesis was only partially correct. I was right about the salt losing the least amount of mass to evaporation., wrong about the sugar- it lost the second least mass to evaporation, wrong about the bleach, it lost the third least , and I was wrong about the peroxide- it lost the least.

If I were to continue with this project, the questions I would try to figure out were whether temperature changes the results, and why some of the same chemicals had different results

NAME(s) **JR Densmore**

PROJECT NUMBER **C04**

SCHOOL Rutland High School

GRADE 11

TEACHER Debra Hathaway

PROJECT TITLE **Acid Strength and Electrical Conduction**

ABSTRACT

ItÆs always been an important part of society to find new ways to conduct electricity. Children ponder about how electricity is created and then thought about how electrons create it and how acids have been a big part of batteries in our history. The question is, what kind of acid produces the greatest charge? The hypothesis is that the lower the pH scale the acid is on, the larger the charge will be since stronger acids usually contain more electrons. Testing the hypothesis it was found that it was true that the stronger the acid, meaning it was lower on the pH scale, was stronger than the pervious. However, the difference was not all that great. Within the test the greatest difference was 1.8 while the 0.50 and 0.10 molars had no noticeable difference. It is clear that the stronger the acid is, the better results, however using a strong acid can be dangerous and not practical for a normal person to use as energy for anything unless bought as an acid battery from a company whose job it is to make such things.

NAME(s) Nevil Desai

PROJECT NUMBER P06

SCHOOL Fredrick H. Tuttle Middle School

GRADE 8

TEACHER Amelia Lutz

PROJECT TITLE **Energy Conservation: The most Efficient Home Insulator**

ABSTRACT

Why do people waste hundreds of dollars every single year because all of their gas or electric heaters warmth is just escaping from the walls? ThatÆs why if you insulate your house with the proper amount of insulation will save the user money and is extremely environmentally friendly because fuel will not be wasted by heat escaping through gaps in the walls. That is what the project is going to tell you, with all these home insulators, which ones do we chose. The experiment uses 4 extremely common insulation materials that houses will most likely have. Heating and cooling accounts for 50 to 70% of the energy used in the average home in the U.S. If this amount of energy can be saved by insulation, it should be put everywhere in a home. Also some homesÆ do not have insulation in their attics to catch the rising hot air, if this was filled with the right type of insulation, than the consumer can save a lot of money. This project will tell what material is the best overall insulator and also which one is the most cost friendly.

NAME(s) Michael Dickout

PROJECT NUMBER B20

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Does Dirt Accumulaiton on Leaves Affect Crop Growth**

ABSTRACT

○Crop plants by the side of dirt roads appear to have accumulative dirt and dust on the leaves. The testable question in this experiment is if the dirt inhibits the photogenic process. Label 50 experimental plants E1 û E50 and 50 control plants C10ûC50. On day one coat the leaves of the plants with watered down clay. Water the plants 20 milliliters of water a day omitting Saturday and Sunday. When measuring the plantsÆ height the measurement will be taken from the soil to the highest point that the plant naturally reaches. Observations of discoloration and if the plants soften will be recorded.
○It is hypothesized that the plants with clay on their leaves will not grow as high or as healthy as the control.

NAME(s) Samantha Donovan
PROJECT NUMBER S06
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton
PROJECT TITLE **Can Gestures Persuade?**

ABSTRACT

This experiment was designed to determine whether somebody that speaks with or without hand gestures could better persuade someone. Though there are many different types of hand gestures the ones that were focused on during this experiment were ones that are most commonly used while speaking. These types of gestures are called conversational gestures. I hypothesized that whether someone talks with or without hand gestures would not affect whether they were persuaded more easily because it is based more on the content of speech rather than what the speaker is doing. The experimental design itself was quite simple. The subjects had to fill out a pre evaluation; they would then watch a 5 minute video of the speaker telling their side of an argument. The subjects would then fill out the post evaluations. There were two videos, both of the same content, one with gestures and one without. The experimental group was with gestures and the control was without. The independent variable was the gestures and the dependent was the subjectÆs opinion. As I said in my hypothesis, I expect that with and without gestures will be similar in whether they are capable of persuading a person. Though I havenÆt yet done any data analysis my preliminary observations show that to be true. So in conclusion I donÆt believe that whether someone talks with or without hand gestures will effect whether someone is persuaded.

NAME(s) Shane Duboff
PROJECT NUMBER B21
SCHOOL Rutland High School
GRADE 11
TEACHER Mrs. Mahar
PROJECT TITLE **The Disappearing Tooth**

ABSTRACT

Have you ever been drinking a soda and thought to yourself about how upset your dentist would be if they ever caught you? Well now you can know why they hate sodas. This project looks at the effects that sodas and other popular drinks have on the health of your teeth. The teeth used in this project were submerged in different drinks for about three days without being disturbed to see the difference in their weights from before and after the three day period. My hypothesis was that the teeth in the drinks that had higher sugar levels and acids in them would end up losing the most weight and be prone to decay. I found that my hypothesis was correct because the teeth in the beverages which lost the most weight did so due to the fact that they contained high amounts of sugar and the most effective acids. Sodas, imagined to be the obvious winners, turned out to be not as corrosive since they did not have as much citric or phosphoric acid as the iced teas. Sports drinks and sweetened teas can have a noticeable effect on your teeth even though they are not carbonated and as acidic as sodas. Of the test drinks, milk was the healthiest for the teeth and caused the least amount of demineralization, however water was the only drink that did not cause any weight loss. So from now on when you are making a choice between soda, iced tea, and water, you will hopefully think of my science fair project.
○

NAME(s) Nicole Dulac
PROJECT NUMBER P07
SCHOOL Windsor High School
GRADE 11
TEACHER Jennifer Townsend
PROJECT TITLE **Effect of shape on flow rate**

ABSTRACT

The purpose of this experiment is to test if it would be possible to drain a body of water through smaller holes that add up to the same area and not lose any time through the different amounts of holes. The focus question of this experiment was that, if there are different sized holes that are equal to the same area, how will it effect the time it takes to drain the body of water? The hypothesis was that if there is only one hole the water has to drain through then it will drain in the least amount of time. There were up to four holes cut in each of the different containers. In order to test this each container with holes cut in the bottom was placed individually into a small container with slightly larger dimensions. There was a plastic, foam matt in between the two containers to act as a seal and stop the water from leaking through the container before the proper time. A mark was pre-drawn onto all of the containers showing where one gallon measured. Four gallons were poured into the given container being timed, and then the container would be lifted up and the timer started simultaneously. When the person timing saw the surface of the water pass the line drawn on the container, they would stop the time. Three gallons were timed draining. The results showed that there was not a significant change in the time it took the water to flow through the holes. lf the experiment was done on a larger body of water with more holes added, the hypothesis is that there may be a more noticeable change but, still not significant enough.

NAME(s) Ciara Eagan, Maryann Pohlen
PROJECT NUMBER GP05
SCHOOL Saint Mary's School
GRADE 6
TEACHER Michelle Eagan
PROJECT TITLE **Germ Invasion**

ABSTRACT

Have you ever wondered how many germs are in your house? Our project is called Germ Invasion, and we used Petri dishes to see which areas in a normal household would result in the most microbial growth. You would be surprised to see how many germs grow in places you thought were very clean. We hypothesized that a room with more human and animal traffic would result in the most microbial growth. For example, a bathroom might have more microbial growth than an attic because a bathroom is used several times a day while an attic is not a common place to visit. First, we set out 20 Petri dishes in nine different places in the house with two in each location. The two left over were used as negative controls. The Petri dishes were exposed for 48 hours. At the end of 48 hours, we sealed them up and let them incubate for two weeks. We observed them under a microscope and made charts of the data. After the experiment and write-up, we sterilized the Petri dishes and disposed of them. Our results showed that germs grew on every Petri dish, even ones that were not exposed to human and animal traffic. Petri dishes that were in warm, moist environments, like the boiler room, had microbial growth without any traffic. We were baffled by the microbial growth on the attic and control dishes, but this just proves our point that germ are ubiquitous. Our experiment affects peopleÆs lives because germs are everywhere and sometimes canÆt be prevented.○

NAME(s) Ira Earle

PROJECT NUMBER P08

SCHOOL Rutland Senior High School

GRADE 11

TEACHER Jody Sabataso

PROJECT TITLE **Aluminum Bat vs. Wood Bat**

ABSTRACT

For over 160 years baseball has been AmericaÆs past time. For years kids and parents have been playing together, whether itÆs in the backyard or on the diamond. Many high school kids grand parents and parents probably played baseball with a lot of their friends after school in the street until dinner time or it got dark out. Now kids can start playing in kindergarten. Until you reach the major league level which not everyone does, you are to use an aluminum bat. Although itÆs not against the rules to use a wood bat, it is preferred that you use an aluminum bat. IÆve always wondered why the MLB (Major League Baseball) doesnÆt allow aluminum bats. An even bigger interest of mine is which bat will hit a ball farther, an aluminum bat or a wood bat? That was the purpose of the experiment. I got two of my friends from baseball and my father to help me out. We started with 25 baseballs, a batting tee, homemade flags as markers, and four bats, an ash wood bat, a bamboo wood bat, a BESR cert. Aluminum bat, and a BBCOR cert. Aluminum bat. BESR stands for ball exit speed ratio, which was the last bat certification before the new one, BBCOR. BBCOR stands for bat-ball coefficient of restitution, this is the newest and current bat certification. This new certification is meant for a safer and more enjoyable game. When you hit the ball with an aluminum bat the ball will come off the barrel much faster and harder than off a wood bat. The BBCOR certified bats are supposed to more resemble a wood bat, by which the ball will come off the bat slower and cause fewer injuries therefore making the game safer. It will still flex and feel the same as an aluminum bat, but have more of the effect of a wood bat.

NAME(s) Luke Farley

PROJECT NUMBER C05

SCHOOL Northfield High School

GRADE 11

TEACHER Cynthia Tomczyk

PROJECT TITLE **The Effect of Different Concentrations of Sulfuric Acid on the Strength of Pine Wood**

ABSTRACT

Acid rain is a part of the modern world, rain created in the atmosphere by the pollution of our earth. Acid rain is very dangerous in certain areas, killing trees by the thousands. In this experiment the general effect of acidity on the strength and durability of pinewood was tested. I bathed similar pieces of pinewood in different concentrations of sulfuric acid, for one week, and then tested each to see how much weight they could hold before they bent or snapped. In order to measure the acid to the proper pH level, I used a pH meter. To test another detail of the wood, each piece was weighed before and after its submersion into the acid. Then percent change of weight for each piece was calculated. To properly determine each piece of woodÆs breaking point, I built a contraption that elevates each piece of wood above the ground and supports the wood on each end. After it is bathed in its solution, the piece of wood is placed on this device. Following this, a platform is hung from the center of the board, and on this platform I placed weights until the wood either bent or snapped. The average weight taken for each piece to break was 20,047 grams for the piece bathed in 7.25 pH; 18,179 grams for 5.80 pH; 11,125 grams for 5.25 pH; 9,234 grams for 3.45 pH; and 18,779 grams for 3.25 pH. The data did not follow any consistent trend: from the pH of 7.25 to 3.45, the weight required to break the wood decreased. However, at pH 3.25 it rose again.

NAME(s) **Carly Ferro** PROJECT NUMBER **P09**

SCHOOL GRADE **11**

TEACHER Debra Hathaway

PROJECT TITLE **The Traveling Golf Ball**

ABSTRACT

DoesnÆt everyone want to know if a golf ball will go farther if it is pulled back a certain distance? This science fair project is supposed to prove that the further the golf club gets pulled back, the further the golf ball goes. The first thing that the researcher did was attach the head of the golf club to the wooden panels with a rubber band. Next, the researcher pulled the golf club back three different distances (16 inches, 22 inches, and 30 inches). Every trial, the researcher had to re-tee the golf ball and place the ball back on the golf tee. The results in this project proved the hypothesis was correct. The further the club got pulled back, the further the golf ball went. This science fair project was made to have people think about and believe that the golf ball will travel on the grass more if the experimenter pulled the golf club back further. Sometimes it depends on the ground quality. The experimenter stayed to doing the project in one day, although it was raining and cold, the results were all accurate, and the hypothesis was proven to be correct.

NAME(s) **Sarah Ferry** PROJECT NUMBER **B22**

SCHOOL South Burlington High School GRADE **10**

TEACHER Curtis Belton

PROJECT TITLE **Liquid Calories in Relation to Body Mass Index**

ABSTRACT

The purpose of this experiment is to determine whether there is a relationship between Body Mass Index (BMI) and the amount of liquid calories consumed in a personÆs daily diet. Due to the difference in the calculation of BMI in children versus adults, this experiment was done solely on adults. Researched data has shown that with a high percentage of liquid calories in comparison to solid calories, BMI will be greater. The original hypothesis was that the BMI of a person would have a relationship to the amount of liquid calories consumed.

To conduct the experiment, each person was given a chart to record their calorie count each day for a period of five days. They were required to fill out a survey including information such as age, weight, height, and amount of exercise to help accurately determine BMI. Subjects were unaware of what experiment was testing, and therefore, hypothetically, data would be unaffected by spontaneous diet changes due to recording. Although data has been seen to show that a personÆs diet can be affected by keeping a calorie count, this experiment was focusing more on liquid calories which are not usually as accounted for.

To conclude this data, percentages of liquid calories in relation to total calories will be calculated, and then graphed next to BMI calculations to determine whether there is a significant relationship between the two or whether there is not.

NAME(s) **Gabby Fionda** PROJECT NUMBER **P10**

SCHOOL Folsom Community Center GRADE **8**

TEACHER Paul Fitzgerald

PROJECT TITLE **Bridges Under Pressure**

ABSTRACT

Abstract:

○Our science fair project was to learn about bridges and take what we learned to make some bridges or our own. We studied the history, the geometry, and the art of bridges. We found out that most bridges that are used everyday have triangle, vertical, or arched supports and crossbeams to withstand more weight and to be safer for pedestrian everyday life. We tested each bridge under pressure and found out where each one broke and analyzed each breaking point on each bridge. We noticed that bridges with less connecting supports break under less weight than the others, so we built a bridge with many more supports to help distribute all of the weight to different points of the bridge, so that it could withstand more weight. We graphed and charted our data. Some bridges seemed to be a lot more successful than the others because of main level supports. We ended up finding out that diagonal crossbeams are the best alongside to the vertical supports. After we built are bridges we designed a new bridge that we thought would be the most successful out of the others. We made it stronger in the placed that were a lot weaker.

NAME(s) **Emily Fish** PROJECT NUMBER **B23**

SCHOOL Northfield Middle High School GRADE **11**

TEACHER Amy Urling

PROJECT TITLE **The Effect of Pharmaceuticals on the Activity and Movement of Bacteria in Wastewater**

ABSTRACT

In this lab, I wanted to see how medications affect the activity of bacteria in wastewater. To do this, I gathered wastewater from the Montpelier Wastewater Treatment Plant, and filled 6, one liter beakers with the wastewater. I then crushed 1, 2, 7, and10 325mg aspirin pills for my first test and Tylenol pills for my second test. I dissolved the medicine and put small samples on a slide. I observed the movement of bacteria in a microscope and scored their activity on a scale of 0-5. My data for the aspirin test, shows that, as there was more aspirin added to the wastewater, there was less bacteria movement. When there was no aspirin and 1 aspirin added, there was fast and active movement (5), when there were 2 aspirins added, the movement slowed down slightly and wasnÆt as fast, but still very active (4). When there were 7 aspirins added there was very slow movement (2) and when there were 10 aspirins added there was no movement at all, and all bacteria in sight was dead (0). All of my data for the Tylenol test shows that as there was more Tylenol added, there was less bacteria movement. When there was no Tylenol added, there was fast and active movement (5), and the same for 1 and 2 Tylenols. When there were 7 Tylenols added, the movement went down to a 3 (fairly slow/ medium movement) for 2 trials and one trial had a 2 (slow movement) for an average of 2.6. When there were 10 Tylenol, two of the three trials had no movement (0) and one trial had very slow movement (1), with an average of .3.

NAME(s) **Hannah Franzoni** PROJECT NUMBER **B24**

SCHOOL Rutland High School GRADE 11

TEACHER Dawn Adams

PROJECT TITLE **Orange or Orange Juice?**

ABSTRACT

The purpose of this experiment is to determine whether an orange or orange juice from concentrate will raise oneÆs glucose levels more. The hypothesis stated that the orange will raise a personÆs glucose levels more because it contains more sugars than orange juice from concentrate. In this experiment three things were tested, an orange, orange juice from concentrate and a glucose tablet (control). A personÆs blood sugar would be tested before and after every time they were to intake one of these, using a glucometer. One would have to wait until they have no sugars left in their body to do each trial and after in taking one of these substances, they would have to wait at least 15 minutes before testing the glucose levels of what they ate or had to drink. In the end the orange was what raised oneÆs blood sugar the most with 21mg/dL as the average. This was followed by the glucose tablet with 14mg/dL and the orange juice from concentrate with 11mg/dL. This experiment concluded that if one were to need to raise their blood sugar then it would be best to have an orange because they contain more sugar and the sugar is also better for you. This contributes to people who have diabetes because if they were to have a low, then by eating an orange, they would be able to raise their glucose levels back to ônormalö.

NAME(s) **Kellie French** PROJECT NUMBER **B25**

SCHOOL Windsor High School GRADE 12

TEACHER Jennifer Townsend

PROJECT TITLE **Methods of Filtering Water in Third World Countries**

ABSTRACT

Every 20 seconds a child in a third world country dies of a preventable, water borne disease. A third world country is characterized by a nations lack of advanced sanitation for the majority of its population. In the United States we enjoy the luxury of turning on the faucet and expecting clean, cool, and clear water to flow. Clear water can be misleading though because bacteria can hide in crystal clear water. In my experiment I used cloth filtration, boiling and adding iodine to test which method would best kill E. coli bacteria. Using the labs at the local Seldon Technologies I made dirty water and after using a filtration method, I grew the samples in Petri dishes. At the conclusion of many trials I determined that boiling water most efficiently eliminates the bacteria from water. This is an accessible solution to many people living with out advanced sanitation and it has the potential to save many lives. Because the method of boiling was both simple and efficient I wondered why people worldwide are still dying from these diseases. It led me to question whether education of the microscopic world affected the likelihood of a person dying of one of the many waterborne diseases.

NAME(s) **Nathaniel Furman**

PROJECT NUMBER **S07**

SCHOOL Windsor High School

GRADE 12

TEACHER Jennifer Townsend

PROJECT TITLE **Family Structure and its Effects**

ABSTRACT

The problem that was studied is how the deteriorating family structure is effects children today. With the growing divorce rate we fail to realize the effects that the parents decisions has on the children. I think that children that grow up in a stable home with both parents are more likely to do betting in school, want to go to college, feel more supported and less likely to get into drugs, alcohol or tobacco. These are stereo-types yes, but it proves to be true through the survey I conducted. I found that most schools in our area go along with the national standard for broken homes. But, the effects of this are the main problem that needs to be addressed. Teacher and students alike should know how this is affecting their performance inside and outside of school so that the children can grow and expand their knowledge. This way our childrenÆs future does not turn out to be the same as ours with broken homes around every corner and children going down the wrong path.

NAME(s) **Lia Gagliuso**

PROJECT NUMBER **S08**

SCHOOL Hinesburg Community School

GRADE 8

TEACHER Stephanie Konowitz

PROJECT TITLE **In Your Face! What Your Expression Says to Another**

ABSTRACT

Your facial expression determines what people will say and what they will feel about you. Subconsciously, we read peopleÆs faces and it comes down to a positive or a negative reaction. I wondered whether there was a specific age and gender that can read facial expressions more accurately than others. To test this, I gathered kids of different age groups and genders. I then gave them a simple test showing a power point of facial expressions, asking them to identify the expression, going with their gut. The results were clear that age had a big factor in reading facial cues. This could be from any number of things from experience with social interactions or intelligence in general. When testing different genders, the results came out almost the same but not quite, females in the lead. This could help teachers and parents recognize whether their kid, depending on their age and gender, is doing something for a reason or they just donÆt recognize facial cues of other people.

NAME(s) Tucker Gilman

PROJECT NUMBER M02

SCHOOL Windsor High School

GRADE 11

TEACHER Jennifer Townsend

PROJECT TITLE **Per Battery Efficiency of Various CPU Clock Speeds**

ABSTRACT

In the past couple of years, smartphones have greatly increased in functionality. Now capable of processing massive amounts of information in mere seconds, it often seems the only restriction is battery life. This experiment is designed to answer the following question; Does underclocking an Android smartphone allow more to be accomplished during the life of one battery charge. The purpose of this experiment is to determine the most efficient CPU clock speed. Three tests were conducted. A simple benchmarking application test was conducted to gather some exact numbers regarding performance drops. A battery test was conducted to measure how long a fully charged battery would last at each clock speed. A third test was conducted to determine page load-times for a picture/media heavy site and a text heavy site. While the data showed that a lower clock speed is more efficient, it also clearly showed the efficiency plateauing after 900MHz. However, something that did not plateau is the drop in performance. Taking this into account, there are two ways to look at the data. The first view takes into account the human element. Since a human would not just load page after page, instantly navigating to the next page the moment the first page loads, this data states that a lower clock speed is better as it is more efficient albeit slower. The second view ignores the human element. At 900MHz there was very little drop in performance, but a large leap in efficiency. Although 900MHz was not as efficient as the lower clock speeds, it was fairly close. This seems to point to 900MHz as being the optimum speed for this particular CPU, as 900MHz enjoys the benefits of both speed and efficiency.

NAME(s) Eric Godzik

PROJECT NUMBER C06

SCHOOL Rutland High School

GRADE 11

TEACHER Ann Marie Mahar

PROJECT TITLE **Acidic Snow Around Vermont**

ABSTRACT

Have you ever wondered whatÆs really in the snow that you have been putting maple syrup on and eating since you were a little toddler? Many people are oblivious to the fact that each snowflake carried a motley array of chemicals that were distributed by factories and automobiles. Although this acidic snow can only affect humans indirectly, it can cause a significant altercation to water chemistry, aquatic life, plants, and animals. I decided to look to see if elevation and location around Vermont has an affect on snow acidity. In order to test this, I went to three mountains: Stowe Mountain in Washington County, Killington Mountain in Rutland County, and Mount Snow in Windham County. For each mountain, I took a sample from the peak of the mountain and a sample from the base of the mountain. After gathering samples from three mountain areas, I drove to Burlington, Rutland, and Bennington and received my third sample there. To accurately receive adequate data, I continued this for a duration of four weeks. My hypothesis stated that if I receive adequate samples from each of the mountains and cities, elevation and location will not affect the snow acidity. Once my data was collected and analyzed, each of the mountains had a constant pH level depending on where the snow was made. After comparing each of the mountains and cities, it is clear that my projected initially supported my hypothesis because elevation and location was not a factor in pH variation in Vermont.

NAME(s) Eric Goodman

PROJECT NUMBER B26

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Effects of Not Bathing on Bacterial Growth**

ABSTRACT

○The purpose of this experiment was to calculate the results of not bathing on bacterial growth on the body. My hypothesis was that the longer the subject went without bathing, the more bacterial colonies would culture from a swab, though my results were not as straightforward. For the procedure, the subject was swabbed every roughly every twelve hours with a q-tip and the collected bacteria were cultured on an agar dish. Once these dishes were given time to incubate I counted the colonies by hand. Each trial took place over the course of four days and I have only finished my first of three trials. Preliminary results suggest that there is no link between the time since the last shower and the number of bacteria cultured after one or two days, but there does seem to be a connection to exercise and the number of bacteria. This is shown by a large spike in the number of colonies recorded at these times. I chose the armpit and the back of the knee as the areas to swab as they are usually both moist and warm, perfect conditions for bacteria to thrive.

NAME(s) Jane Goodwin

PROJECT NUMBER M03

SCHOOL Woodstock Union High School

GRADE 10

TEACHER Patricia Murray

PROJECT TITLE **Exotic Spheres in 4-dimensional Hyperspace**

ABSTRACT

Topology is the mathematical study of qualitative properties of manifolds (called topological spaces) that are invariant under certain kinds of deformations (defined as deformations that involve ôstretching, but no tearing or gluingö). In the first, second, and third dimensions, all topological spheres are both differentially and homeomorphically topological; that is, they both are equipped with a differentiable structure, also known as being a smooth manifold, and are logically spherical under the perimeters of topology. It is impossible for spheres to exist in dimensions below the fourth without being both homeomorphically and differentially topological, and until John Milnor's discovery in 1957 of spheres in 7-dimensional euclidean space with nonstandard differentiable structure it was considered an impossibility in all dimensions He went on to discover 15 possible structures of nondifferentiable spheres in the 7th dimension. These became known as exotic spheres, and after his discovery of them in the 7th dimension were found in all dimensions above the fourth. Whether at least one exotic, or ônonstandardö differentiable structure, of a sphere exists in four-dimensional Euclidean space remains unknown and is the basis for my research. ○All Euclidean dimensions above the fourth are known to have exotic spheres within them. However, it is unknown whether a nonstandard differentiable structure can exist for 3-spheres. This research will attempt to explore Gluck twists and their properties as possible 3-spheres with nonstandard differentiable structure. A Gluck twist has many properties similar to a Mobius strip in 4 dimensional space- it is described as a shape that is made up of two distorted one-spheres that create a space that has two sides but four edges. Because of incongruities in the way a Gluck twist is described, it has been proposed as a possible exotic sphere in 4-dimensional space. This research will attempt to prove conclusively a Gluck twist as a 3- sphere with nonstandard differentiable structure.

NAME(s) Alexandra Groen
PROJECT NUMBER B27
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Decomposing Plastics**

ABSTRACT

The purpose of the lab is to test the different components of decomposing plastics and how effective they are. The plastics being used are starch-based, petroleum-based, and K-cups, which combined with additives, create the plastics; when these plastics are exposed to biodegrading, the process by which matter is broken up by living organisms, and photodegrading, the process by which the UV lights weaken and break down the polymers in plastics, they decompose. The starch-based plastics in the biodegrading process are hypothesized to have the best results. The ways of decomposing being used are setting the items in regular sunlight (control), biodegrading (experimental), and photodegrading (experimental). The plastics being used are petroleum-based water bottles, starch-based knives, and K-cups. Three of each substance will be placed in each type of decomposing process. Once, every week, the masses of each substance will be measured in grams, for ten weeks. The data has all been collected. The starch-based plastics in the photodegrading process have had the most results and the K-cups in the control have had the least results. I will analyze this data. In conclusion the data proved the hypothesis incorrect and analyzing the data will conclude if these results are accurate.

NAME(s) Samuel Hall
PROJECT NUMBER C07
SCHOOL Weathersfield School
GRADE 8
TEACHER David E. Lambert

PROJECT TITLE **Producing the Fuel of the Future: Hydrogen**

ABSTRACT

I wanted to find the most efficient way to produce hydrogen through electrolysis. I found that hydrogen power is a new resource that has barely been tapped into. The Honda Clarity is a hydrogen powered car that has been produced as one of the first hydrogen cars. You bring it to one of the few hydrogen stations in the U.S. and fill it up. However, in many searches of the web, I was unable to find a specific study showing what the most efficient electrode to use to make hydrogen was. So I embarked on my experiment.

Several sites show how to make hydrogen with electrolysis. They all suggested using graphite from pencils or copper wire. I found a science supply site and purchased two sets of eleven different types of electrodes all the same size. I predicted in my hypothesis that the graphite conductors would be the fastest because they were the most commonly suggested.

I also got the battery out of my lawn tractor. I used a copper wire to hook the battery onto electrodes. With a bolt and nut on each electrode, it was tightened up against the electrode. I filled a bucket with twelve and one half liters of water. In the water I put in 1000 grams of salt. I stirred it around and made a very salty solution.

The electrodes were put on the bottom after they were hooked up to the wire. The wire was then connected on the other end.

My father made a piece of wood with a piece cut out of it. I attached a funnel to a graduated cylinder. I completely submerged the cylinder and then turned it upside down. It fit into the cutout in the wood. So I would put the wood across the bucket and fit the graduated cylinder into it over the electrode to collect all of the bubbles of hydrogen.

NAME(s) **Dustin Hargy**

PROJECT NUMBER **G01**

SCHOOL Avalon Triumvirate Academy

GRADE 11

TEACHER Amanda Gifford

PROJECT TITLE **Star light intensity**

ABSTRACT

Scientists have come to the general conclusion that there is a zone between a star and the edge of its solar system. In this zone, it is possible for life to exist if there is a planet to live on. The experiment tested light intensity from a light bulb and is a simulation of the change of intensity of starlight over distance. As a light bulb ôstarö gets farther away from the light meter, the light intensity should get weaker and lower on a scale of Lux. A space of six feet was set up in a darkened room with a lamp, tripod, and tape measure. The tape measure was set under the center of the lamp. Using a light meter and a light bulb, the light intensity was measured in Lux with the variable of distance changing at six-inch increments. The results showed a noticeable pattern in the change in Lux in overall and the trials in general. The data showed that there was a greater change in the beginning increments than the last few increments. In addition, there was a slight margin of error occurring when a few numbers jumped back up on the scale instead of continuing on a downward course. With the hypothesis, being proven correct it is determined that the intensity of light moves on a downward course as the distance between the measuring device and light change.

NAME(s) **Alayna Hauke, Basa Zvarova**

PROJECT NUMBER **PN00**

SCHOOL Rice Memorial High School

GRADE 12

TEACHER Sharon Boardman

PROJECT TITLE **Weather and Water Quality**

ABSTRACT

This project investigates the effect of varying levels of precipitation on the water quality in multiple streams in Vermont. The hypothesis that greater amounts of precipitation decrease the water quality stems from the concept that the larger levels of rain lead to increased amounts of runoff in the streams. As a result of the runoff, particles enter the water and negatively impact the water quality.

In order to determine water quality, samples were taken every two weeks from various streams around the state and were then analyzed for amounts of Escherichia coli, total phosphorus and total suspended solids. The results help determine levels of water quality throughout the state due to various sources of pollution and environmental impacts.

This study looks at the correlation between the amount of precipitation the day before sampling and the levels of the three aspects of water quality listed above. In the past year, extreme weather patterns affected Vermont, including tropical storm Irene, which arrived in late August. The larger than usual levels of precipitation changed the physical appearances of the streams by eroding the sides and raising the depth and stream flow, as well as altering the water quality. Over the course of the sampling dates, the levels of rain differed significantly, providing us the opportunity to analyze the impact of the water levels on the streams.

The hypothesis held true for the streams analyzed. With greater levels of precipitation, all three areas (E. coli, phosphorus and TSS) increased. On the sampling date following Irene, the values went up greatly, which showed an extreme comparison in the correlation between precipitation and water quality. The project led to the understanding that higher levels of precipitation result in lower water quality.

NAME(s) Quentin Heinzer

PROJECT NUMBER B28

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Coliform Bacteria in Vermont rivers and Streams**

ABSTRACT

○This experiment shows what the main reasons for Coliform bacteria in rivers and streams are. Testing for Coliform bacteria is used to indicate the possible presence of harmful pathogens in bodies of water. They are an indicator organism. I predict that if the river and stream is below freezing, fast moving, has a lot of white oxygenated water, and limited animal contact, then it will contain the least amount of coliform bacteria. This experiment consists of four water tests at two different places. One site has barely to zero human influence. The next site is high in human activity. It receives run-off from agricultural and urban centers. The naturally influenced site is the control. The artificially influenced site is the experimental. The independent variable is the combined characteristics of the two test sites: Including weather, temperature, geographic features, and animal life including human activity. The dependent variable is the amount of coliform bacteria found in the water. The main test materials used are a thermometer for water and air that goes below freezing, and MILLIPORE coli-count test paddles used to test for coliform bacteria. A camera was employed to record the independent variables. Tests so far show that neither of the tests site have coliform bacteria. Conditions will be compared to determine what conditions are needed to have or not have coliform bacteria. This will determine what river conditions require remediation or regulation to improve water drinkability.

NAME(s) Daniel Hellen

PROJECT NUMBER B29

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Zebra Mussels' Effect on Phosphorus Levels**

ABSTRACT

This experiment is designed to observe how much of an impact on phosphorus levels zebra mussels, a filter feeding species, have. In Alan E. WatsonÆs experiment, published in 2003, zebra mussels caused the amount of phytoplankton, which in part use phosphorus to grow, to decrease by 53 percent. In Lake Champlain in Vermont, the increase in blue-green algae (Cyanobacteria) has been linked to a high amount of phosphorus pollution in the lake. Perhaps zebra mussels are significantly helpful to the reduction of phosphorus. There are multiple ways to measure phosphorus, including a chemical test, but an electronic measurement tool, like an ion specific probe, would provide specific, low-level readings. To perform this experiment, zebra mussels will be put in a tank with a level of phosphorus that is in polluted parts of Lake Champlain. The phosphorus level at the top of the tank will be consistently measured for a three week period. Phosphorus that does not show up on these readings would have been filtered by the zebra mussels and released onto the bottom of the tank. The phosphorus at the top is the phosphorus that could increase Cyanobacteria growth. The results from this experimental group will be compared to the results from the control group, a tank with phosphorus in it but no zebra mussels. If the level of phosphorus at the top of the tank is significantly lower in the experimental group, it can be concluded that the zebra mussels were the reason for that.

NAME(s) Sara Henni
PROJECT NUMBER C08
SCHOOL Rutland High School
GRADE 11
TEACHER Dawn Adams
PROJECT TITLE **Fabric Meets Dryer**

ABSTRACT

This experiment tested whether wool, polyester, denim, or cotton was least affect in size by the heat of a dryer. I hypothesized that the polyester fabric would have the least change in size when put into the dryer. To test this, ten trials of the four different fabrics were put into a dryer on high temperature for 20 minutes. After, the size of the control and the tested fabrics were measured and noted. The tests prove that polyester has the least change in size, denim had the second least change of size, wool was third, and cotton had the most change in size compared to its control. Polyester changed only an average of .1 cm, denim changed an average of .1cm by .2cm, wool changed an average of .1cm by .5cm, and cotton changed an average of .5cm by .8cm. These changes were made because of the way the fabrics are made. Cotton, wool, and denim are all first stretched out before woven together, while polyester is not causing it not to shrink as easily. With the experiment, I did meet my objectives and my hypothesis was accepted. This project can help people understand why heat of a dryer has that effect on the clothes they are drying and can teach them which fabrics should be dried on high, and others on low. 

NAME(s) Joey Hester
PROJECT NUMBER P11
SCHOOL St. Francis Xavier School
GRADE 8
TEACHER Mary Ellen Varhue
PROJECT TITLE **Juicy Fruit**

ABSTRACT

○Dye-sensitized solar cells are helping to provide clean energy for our world.
My research question was which dye produces the most electrical power in a dye-sensitized solar cell. I had a kit with five dye-sensitized solar cells that had to be assembled. I used different dye solutions for each cell. The five dye solutions were blackberry, raspberry, kiwi, raspberry /blackberry, kiwi/raspberry.
○My hypothesis was that the raspberry dye would produce the most power. I chose this because while doing my research most of the other experiments used raspberry dye.
Each cell consists of two pieces of conductive glass. First I found the conductive side of each using a multimeter, and then coated one of the conductive sides with a titanium dioxide paste leaving a 4mm border on one of the sides and then baked it on a hotplate for 10 minutes. After, I put the piece of glass in a bowl of juice for 12 minutes. With the other piece of glass I used a graphite pencil to coat the conductive side leaving a 4mm border on one of the sides. I then placed the piece of glass with the dye on it on top of the piece of glass with the graphite coating. I offset the glass so that there was 4mm of clean glass sticking out on two opposite sides. I used binder clips to hold it together. I used one drop of an iodine electrolyte solution a squeezed it into the middle of the cell. I then tested the voltage produced by each cell.
○After doing my experiment I can conclude that blackberry juice produces the most power, this did not prove my hypothesis. I think that it turned out this way because blackberry juice is the darkest so it attracts the most light.

NAME(s) Ryan Hester
PROJECT NUMBER P12
SCHOOL St. Francis Xavier School
GRADE 7
TEACHER Mary Ellen Varhue

PROJECT TITLE **Windy Washers**

ABSTRACT

○People are always trying to find more efficient ways to produce power by using wind. My experiment is to see if there are more blades on a wind turbine will it produce more power. I wanted to do this project because when I was going to Iowa I saw big trucks on Interstate 80 that were carrying massive wind turbine blades. To set up my project I built a stand and had a spool of wood with a nail through it. I cut blades out of balsa wood, sanded them, and glued each one to a wooden rod. I set a fan sixty-eight inches away from the stand and twenty-four inches high. I would set the fan on low, medium, and high for all amounts of blades and then I would average the results.

The problems that I ran into were that the tape that was holding the string on would fall off. The blades werenÆt exactly at forty five degrees. Another problem that I ran into was that the string would always become twisted and it wouldnÆt pull up as much as it would when the string was straight so I had to redo my tests.

After doing my experiment I concluded that six blades produced the most power on my wind turbine. Therefore, the greater the number of blades, the greater the amount of power. However, due to the cost of building large wind turbines, from observations, I have determined that three blades is the most economical configuration. The amount of power gained from adding blades, must not be enough to cover the cost of the additional blades.

NAME(s) Taylor Hough
PROJECT NUMBER C09
SCHOOL Rutland High School
GRADE 11
TEACHER debra hathaway

PROJECT TITLE **Which Brand of Makeup Lasts the Longest**

ABSTRACT

Which foundation brand will last the longest? That is the question every woman is dying to know. Rimmel London having its mineral composition spiked the hypothesis that Rimmel London would last the longest. The experiment was conducted by first choosing five different brands of makeup, four store brands and one consultant based brand. Then, the filter paper was massed alone and then each brand of makeup was spread on the paper six different times then massed it again. The papers were left to dry overnight. Then, the papers were submerged into individual beakers of water for three minutes each. After, letting the papers dry once again, the paper was massed again to see how much of the foundation remained on the paper. The experiment proved that it did not matter what the composition of the makeup was, it was the form it was made in. Liquid is not necessarily the best makeup for long lasting wear. The makeup that ended up lasting the longest was Mary Kay, even though it was a translucent powder, the amount that absorbed in the paper was the amount that remained in the end.

○All in all, Mary Kay, a translucent powder is the longest lasting foundation. There were a few instances where another brand lasted longer than Mary Kay. This was due to the amount of makeup I spread along the paper. Throughout the experiments, the initial hypothesis was proved wrong supported by data and charts.

NAME(s) Elise Huntley
PROJECT NUMBER G02
SCHOOL Homeschool
GRADE 11
TEACHER Christine Colella

PROJECT TITLE **Are Macroinvertebrates Vermont Strong? Monitoring One StreamÆs Recovery and Water Quality**

ABSTRACT

After Tropical Storm Irene devastated Beaver Brook in Wilmington, recovery dredging was necessary to repair surrounding land use. If the macroinvertebrates recolonize, the predominant orders will be indicators of the water quality in the stream. Contingent on this study, stream management practices such as selective dredging should be reconsidered in order to provide a better balance between the stream ecology and populated townships.

Macroinvertebrate samples were taken twice after the August flood; once in September and again in October. After identifying these samples, they were compared to the macroinvertebrate numbers that were found in the previous two years of data. A bar graph was created from this data to exhibit the differing quantities of EPT (Ephemeroptera, Plecoptera and Trichoptera) versus the other orders of macroinvertebrates. This EPT Index is a common indicator of water quality because these macroinvertebrates are intolerant to pollutants. Starting in July, water samples were tested for E. coli, Total Phosphorus (TP) and Total Suspended Solids (TSS). The data was compared in a chart with the results of previous water sampling.

By comparing the data from the previous two years to the samplings from this year, the macroinvertebrates were repopulating to their normal levels two months following the flooding and subsequent dredging. The overall water quality for 2011 remained consistent with preceding years, except for a slight increase in TSS. This is expected because of the turbidity after the flood which suspended the solids.

The research showed that the stream recovered to its normal state in a short time after the devastation of this flood event. Scheduled and monitored selective dredging, in accordance with the best stream management practices, should be revisited, studied and implemented in order to find a better equilibrium between rivers and surrounding communities.

NAME(s) Curtis Ianni
PROJECT NUMBER P13
SCHOOL St. Francis Xavier School
GRADE 7
TEACHER Mary Ellen Varhue

PROJECT TITLE **Super Panels**

ABSTRACT

Mirrors directing light toward a solar panel increases the amount of voltage collected. So mirrors can substitute for the need to add more solar panels to generate voltage. Changing the mirror angles will increase the voltage collected I hypothesized that I could increase the voltage output with mirrors.

My procedure was as follows:

-Tape a 1 and 1 half in. tall 4 and 1 half in. long by 3 in. wide small cardboard box to the direct center of a 17 and 1 half in. tall 11 and 1 half in. wide and 23 in. long plastic bin.

-Tape a solar panel on the top of the small cardboard box.

-Tape 1 mirror 3 cm away from each side of the cardboard box.

-Connect the solar panel to a voltmeter

-Angle mirrors at 90 degrees and recorded how much voltage is produced when the light is directly overhead.

-Angle the light 130 degrees to the right of the panel and record how much voltage is produced when the mirrors are 90 degrees to 180 degrees in 10 increments.

-Angle the light 130 degrees to the left of the panel and record how much voltage is produced when the mirrors are 90 to 180 degrees in 10 degrees increments.

More voltage was produced with mirrors because the mirrors focused more light towards the panel. The mirrors acted as extra sun collectors for the panel. I noticed that the mirrors at specific angles produced more volts then other angles.

By placing the 4 mirrors on all 4 sides of a solar panel and measuring the voltage collected in 10 degrees angle increments; different angles can improve the voltage collected by up to 14 percent. Using larger panels and larger mirrors could increase the voltage produced on a huge scale.

NAME(s) Paige Inslee
PROJECT NUMBER S09
SCHOOL Mater Christi School
GRADE 7
TEACHER Mark Pendergrass
PROJECT TITLE You Break It You Buy It!

ABSTRACT

The hypothesis for this project is if the consumer has the opportunity to physically interact with a product, then they are more likely to choose that product over one that is verbally described to them. Sources used for Background research were many websites, a few magazines, and some articles. Research was done on what stores do to make the atmosphere more appealing and what attracts the consumer. Research was also done on whether online or in store shopping gets more business and how the consumer reacts to certain details about the product. áRetail, brick-and-mortar, consumer, commodity, and senses were all defined in the background research. This projectÆs procedure had 30 people sit at desks in a classroom and filled out a questionnaire. The volunteers passed around a rubix cube, and after having played with it, they completed the questionaire. áA classroom setting was used to test the experiment. áResults found that more people chose the puzzle they could interact with over the one that was verbally described to them. 20 people choose the puzzle they could interact with over the 10 people who chose the puzzle that was verbally described. The data concludes that the consumer prefers being able to interact with a product before they buy it, over just hearing a verbal description. áá

NAME(s) Eliza Jackson
PROJECT NUMBER B30
SCHOOL The Renaissance School
GRADE 6
TEACHER Eve R. S. Dubois
PROJECT TITLE Natural vs. Artificial Flavors

ABSTRACT

I wondered if people would tell the difference between natural and artificial flavorings.

My hypothesis is that I think my subjects will not be able to tell the difference between natural and artificial foods because the taste will not differ very much. I have tried some foods of the same type but with natural and artificial flavors, and I could not tell the difference, but maybe different people have stronger taste buds than I. When I was conducting my test, I would put a blindfold on the subject and have them eat both natural and artificial foods with a cracker and water in between the foods. Then I would ask what food they liked better and which food they thought was natural. The foods were toaster pastries, Oreos and Newman-os, and natural and artificial cheese puffs.

In my tests, the average for what tasted better was in both cases was 5.33 so that there was no difference between whether people liked natural or artificial flavors better. The test subjects in each grade that I did liked all of the flavors the same. I used percentages to make it easier to compare the groups because the groups were different sizes. More people picked the incorrect flavor as the natural flavor. As the children got older, they got more right answers than wrong. The first graders got 0.00% correct answers, the third grade answered 33.33% correctly, and the fourth, fifth, and sixth grade got 60.00% correct.

As children's bodies get bigger, they start to develop their taste buds and more start to form. Children's taste buds are more sensitive than adults. Taste is affected by your sense of smell and expectations. If you're trying a new food and you think you're going to like it, you most likely will. In a study at the University of Western Sydney, the scientists found out that kids had a higher level of papillae density than adults.

NAME(s) **Brent Jacobs**

PROJECT NUMBER **P14**

SCHOOL St. Francis Xavier School

GRADE 8

TEACHER Mary Ellen Varhue

PROJECT TITLE **Spinning Out**

ABSTRACT

My project is testing to see which tire is better for common off road driving. My research question is which tire is better for off-roading: studded or mud?
I chose this project because I am interested in how we can make ourselves and our vehicles more adapted to our natural surroundings.
I predict that the mud tires will have a better overall performance than the studded tires. I predict this because I know that mud ties have large treads and thus will have more gripping force than the studded tires which do not have treads. There is a chance that the mud tires gripping force could work against it and dig the tires into a rut since the test vehicle is only rear wheel drive. My procedure is as follows:
1. Get a remote control car and a stopwatch.
2. Set up a tarp and fill it up with evenly spread sand.
3. Place car with mud tires at front of track.
4. Start watch and floor it until it reaches the end of the track.
5. Record the time
6. Repeat steps 2-5 with ice and with stone.
7. Build a set of 4 tires with screw studs in them.
8. Repeat steps 2-6 with studded tires.
9. Compare the results.
The mud tires displayed the best performance on sand and the studded displayed the best performance on both stone and ice.

NAME(s) **Abigail Jacunski,**

PROJECT NUMBER **B31**

SCHOOL The Renaissance School

GRADE 5

TEACHER Eve R. S. Dubois

PROJECT TITLE **How the Human Ear Affects Your Center of Balance**

ABSTRACT

My question is how does the human earùif you are pulling down on it, just standing on one foot, or spinning around five timesùaffect your center of balance? I wonder this because I read in a newspaper that someone did a survey on if it took longer for deaf people to learn to walk than someone who was not deaf. They actually found that deaf people learn to walk faster than people who can hear. So I decided to do this as a science fair project.

My hypothesis that I think someone could stand on one foot while staring at something for the longest amount of time because you are focused on something that is still, so your head becomes still and your ear gets tipped so the liquid in your ear that helps you balance gets centered and helps you balance.

My procedure is that I will ask people to stand on one foot, spin around 5 times and stand on one foot, stare at something and stand on one foot, and pull down their ears. I will record my data by assigning numbers to the people I am testing, and I will be timing them on how long they can stand on one foot and do the things I ask them to do.

My results are that if you stand on one foot while staring at something you will have better balance than if you pull down on your ears, spin around or just plain stand on one foot. I know this because I averaged out my results and got the biggest number for staring and standing on one foot when I averaged all my results out.

My conclusion is that staring at something while standing on one foot works best for balancing on one foot. I know this because in my research I found out that staring at something helps you balance because there is some liquid in your ear. It helps you balance because it detects the liquid moving, and if you are focusing on something, most likely your head is not going to be moving because you are staring at something.

NAME(s) Alex Jakubowski
PROJECT NUMBER B32
SCHOOL Fair Haven Union High School
GRADE 9
TEACHER Mr. Morris

PROJECT TITLE **Do Plants Grow Better In Organic or Fertilized Soil and All Light, No Light, or Natural Li**

ABSTRACT

○Overall, my project was to see if plants in organic soil in fluorescent, natural and no light will be as productive as plants in fertilized soil in the same environments. To do this I first got twenty-four pots and put soil in each one. I than put fertilizer in twelve of them and put three seeds in every pot. I put four pots in a dark room, four pots in a window, and four pots under a fluorescent light that was left on twenty-four hours a day. I watered the plants every day and measured and recorded the height of each seed every week for six weeks. When I analyzed my data I saw the seeds in the organic soil grew the tallest and the majority of the seeds grew. The seeds in the fertilized soil did not produce many plants at all. I think I may have over fertilized the seeds because hardly any seeds grew. However, the seeds that did grow were not as tall as the seeds in the organic pots, thus the organic soil grew the best.

NAME(s) Benjamin Jewkes
PROJECT NUMBER S10
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Teaching Humans**

ABSTRACT

The purpose of this experiment is to determine out of two different methods of teaching and a combination of the two, which is best to teach high school aged students. Research has shown that there are three different methods students use to learn: kinesthetic learners learn by manipulating objects, audio learners learn best by hearing the information, and visual learners learn the best with visual materials. The two of three methods used in this experiment were audio, visual, and a combination of audio and visual in one test. The results that were predicted were that the combination of audio and video tests would be the most effective to teach with. To perform this experiment every participant is given one test. This will be an audio, visual or audio and visual combined test. The visual test was performed with a one minute time limit to study the flashcards from, and the other two tests are based off of one presentation. The results are then recorded and averaged to find out which method was the most effective. Preliminary results indicate that visual and audio/visual combination are about equal in effectiveness, while audio tests do not match up. For a final conclusion to be reached more data must be collected, but so far my hypothesis has not been proven.

NAME(s) Raihan Kabir
PROJECT NUMBER B33
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **The Effectiveness and Viability of Arsenic Bioaccumulation**

ABSTRACT

The purpose of this project was to determine whether metal-tolerant organisms that intake atypical quantities of nutrients effectively extract arsenic from soil and groundwater. While the World Health Organization holds arsenic accountable for causing the greatest mass poisoning in human history, the United States Department of Agriculture highlights a recent use of plants in decontaminating metal-adulterated soils. This two-fold experiment investigated the phytoaccumulating capabilities of sunflower (Helianthus annuus) and the Chinese ladder brake fern (Pteris vittata) in arsenic-laced soil, as well as the bioaccumulating capabilities of cyanobacteria (Anabaena) and green algae (Chlamydomonas reinhardtii) in arsenic-laced water. Each test sample in the experimental group contained an organism mentioned above, either soil or water, and sodium arsenate. Confounding variables were avoided by maintaining a scientific control group throughout experimentation in which an organism was never introduced. With exception to the accumulating subject itself, all conditions were kept uniform throughout all systems and experiments. Two simultaneous tests were conducted with different levels of arsenic to assess how varying quantities of the toxic metal affected the organism and its ability to intake arsenic. After three weeks, microwave-assisted nitric acid digestions of isolated plants and algae were taken and utilized in conjunction with an inductively coupled plasma optical emission spectrometer (ICP-OES) to measure the precise amount of arsenic accumulated by each organism. Though experimentation is hitherto incomplete, preliminary statistical analysis indicates that these nutrient-demanding organisms do indeed bioaccumulate arsenic to a certain degree, thus assuredly rejecting the null hypothesis.

NAME(s) Jenna Keith
PROJECT NUMBER C10
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **Temperature's Effect on Battery Life**

ABSTRACT

As many Vermonters know, harsh winter temperatures often take a toll on battery life, causing them to malfunction, or die completely. Therefore, the purpose of this project is to test how different, decreasing, temperatures affect battery life. I hypothesized that the lower the temperature was, the shorter amount of time the battery would last. Heat is a form of energy, which drives chemical reactions. Therefore, I thought that with this energy taken away, the reaction would slow and eventually stop, resulting in the battery lasting a lesser amount of time. To test my hypothesis, an apparatus was constructed, consisting of a single AA battery holder, connected by wires and alligator clips, to a light and an analog clock. As the light burned, the batteryÆs power decreased, and the clock moved. Ultimately, the clock displayed the time the battery lasted, since it stopped running when the battery died and the light went out. In this project, three different types of AA batteries (Interstate PowerVolt, Workaholic, and Workaholic Gold) were tested at three different temperatures. The different temperatures were 21 degrees Celsius (room temperature), 3 degrees Celsius (the temperature of a refrigerator), and -22 degrees Celsius (the temperature of a freezer). After testing each battery three times at each temperature, I found that all three types of batteries lasted the longest at 21 degrees Celsius, on average, 3 to 4 hours. All three types lasted the second longest amount of time at 3 degrees Celsius, on average 1 to 2 hours. Lastly, all three types lasted the least amount of time at -22 degrees Celsius, 30 minutes, on average. Therefore, my hypothesis was accepted. As temperature decreased, so did the time the battery lasted, indicating that for the temperatures tested in this experiment, temperature and battery life were directly related.

NAME(s) **Brian Kiernan** PROJECT NUMBER **P15**

SCHOOL St. Mary's GRADE 6

TEACHER Mrs. Baker

PROJECT TITLE **Catapults**

ABSTRACT

Bombs away! Everyone wants to launch something in a catapult. Catapults have been around since the 3rd and 4th century in China. Most of them were used as weapons. Now, catapults are used to explain trajectory, angle of measurement, and NewtonÆs second law as well as many more topics about physics. A catapult operates by placing a load to be launched at one end of some sort of arm. I wanted to use the catapult to find out which ball travels the furthest a ping-pong ball, a golf ball, and a rubber ball? I launched a ping pong ball that weighed less than ten grams, a golf ball that weighed 50 grams, and a bouncy ball that weighed 60 grams while keeping the pull-back angle and the launch angle the same. I shot each ball three times. My hypothesis stated the lighter ball would go further if I kept the force applied the same for each launch. I knew this because of NewtonÆs second law of motion F=M╫A. You can turn it around A=F≈M Acceleration equals force divided by mass. If the force was the same, same two rubber bands of tension and pull-back angle of 50, then as the mass got heavier then the arm of the catapult would go slower. My hypothesis was correct; the lighter ball went 11 feet and 3 inches while the rubber ball went only 5 feet. . The catapult is a very interesting first class lever, and I learned so much about NewtonÆs second law. Next time I will try to shoot a target using my catapult.

NAME(s) **Hyun Jung (Sally) Kim, Alison Cook** PROJECT NUMBER **GP03**

SCHOOL Essex High School GRADE 12

TEACHER Mark Paul

PROJECT TITLE **Conducting Electricity Using a Microbial Fuel Cell**

ABSTRACT

The purpose of this experiment was to assess the energy output of different sources of microbes. We tested chemical/biological waste, sanitary waste and river water. We hypothesized that sanitary waste would produce the strongest sustained voltage, due to the high concentration of intestinal anaerobic microbes.

Procedure:
○-Made nutrient agar with electrolytes (NaCl), poured into tube.
○-Made electrodes using carbon cloth, copper mesh and alligator clip wires.
○-Installed electrodes in each chamber.
○-Connected the two chambers with agar-filled tube, ensuring an airtight and
○watertight seal.
○-Collected and deoxygenated (using nitrogen displacement) three sources of
○microbes.
○-Added one source of microbes to first chamber (anode), and saltwater to the other
○(cathode)
○-Took daily readings in milivolts for each of the three fuel cells using a voltmeter.

Data:
○ Chemical/biological waste had the highest and most sustainable voltage. It peaked at 373.6 mV after three days, and decreased much more slowly than the others. The sanitary waste started low at 22.5 mV, shot up to 137.7 mV after three days, and then decreased rapidly shortly thereafter. The river water produced a large immediate voltage of 324.3 mV, but then decreased relatively slowly after that peak.

Conclusion:
○Contrary to our hypothesis, the best source of energy was the chemical/ biological waste. This waste has more nutrients, which generate more oxidation-reduction reactions and keep the microbes alive for longer. To continue this research, we plan to test each fuel cell for a longer period of time, run multiple trials, and test the capacity of sludge.

NAME(s) Sabina Latifovic
PROJECT NUMBER S11
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis R. Belton

PROJECT TITLE **Perception of Beauty in Regard to Facial Symmetry**

ABSTRACT

The purpose of this experiment was to test whether facial symmetry influenced how high school students perceived attractiveness in males and females. Research done by Anthony Little et al. (2011) showed that when participants found a trait beneficial, they were more apt to find that trait attractive. Some research has found people with more symmetrical faces to be healthier. My hypothesis stated that the symmetrical faces would rank as more attractive than unedited and asymmetrical faces. To test for perceived attractiveness, I plan on giving participants a survey with pictures of male and female faces edited for perfect symmetry and for asymmetry against a control of an unedited face. Participants will be asked to rank the faces from most attractive to least attractive. The data will be analyzed by comparing the percentages of ranked attractiveness per face.

NAME(s) Corina Lawrence, T.J. Beaumier
PROJECT NUMBER GP08
SCHOOL Avalon Triumvirate Academy
GRADE 11
TEACHER Amanda Gifford

PROJECT TITLE **Helicopter blade shape**

ABSTRACT

The affects of different wing shapes and sizes on the fall of paper helicopters was tested in the science fair project. It was hypothesized that helicopters with larger blades will fall slower then helicopter with smaller blades. Many sheets of thin cardboard, a few rulers, sharpies, and scissors were used. A control size of three inch long by one and a half inch wide blades was determined. Next every size in half inch increments from half an inch wide and one inch long to three inches wide and five inches long was built and tested. It was observed that square shaped wings seemed to fall the most gracefully, and have the most consistent time. When the blades got too big or too small they tumbled and did not spin. Analysis of the data showed that, up to a certain point, the helicopters seemed to follow a regular pattern. Starting small, as they got bigger their time became slower. Sometimes, wings that were proportionally the same fell with very different times. In conclusion, the hypothesis was largely correct. They do fall slower when they have larger blades. However, some of the helicopters fell so badly that they did not conform to the data in any way.

NAME(s) Maraika Lumholdt

PROJECT NUMBER B34

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Music Preference and Emotional Activity (Heart Rate)**

ABSTRACT

The purpose was to see how emotional activity (heart rate) affects music preference. It was shown by Anne J. Blood and Robert J. Zatorre that responses to music occur in the part of the brain correlated with emotion (Blood & Zatorre, 2001).The hypothesized outcome was that the most preferred song would show the highest heart rate. Human participantsÆ preliminary heart rate will be measured, then compared to the heart rate measured while theyÆre listening to three songs, that the subject ranked in order of preference. The heart rates (preliminary and during music being played) will be compared. Te preference for music genres is dependent on heart rate. Heart rate will be measured with a heart rate monitor. Through testing, I expect to find that the heart rates will significantly increase from the preliminary rate when preferred songs are played. In conclusion, music preference is affected by emotional activity, indicated by heart rate.

NAME(s) Liam Lustberg

PROJECT NUMBER B35

SCHOOL The Renaissance School

GRADE 6

TEACHER Eve R. S. Dubois

PROJECT TITLE **Fun Foods**

ABSTRACT

The science fair project that I am doing is about whether the shapes of different foods influences their tastes. I was inspired to do this project because of a book about food that talked about the modern food industry and how the shapes of foods have, in some cases, become more important than the foods themselves. I am trying to find out if there is a distinct relationship between shape and taste, or if the book was wrong.

I thought that there would be a distinct relationship between shape and taste, and that the foods with the interesting, "fun" shape would be better suited to children because it feels like a new food phenomenon and it may have a better texture (thicker, thinner, longer, shorter, et cetera). I have tried all these foods, and I must say that I like the fun shaped ones better, mainly because of the differences in texture.
When testing someone, I first instructed him/her to close their eyes. Then, I had him/her taste one of four different foods. The foods were Lays Classic potato chips, Lays Wavy potato chips, Rold Gold pretzel rods, and Rold Gold pretzel twists. I had the test subject rate each one on a scale numbered one through ten. One meant bad-tasting food, and ten meant great-tasting food.

The conclusion I finally gathered from my data partially proved my hypothesis. I actually found that the Classic potato chips were thought to taste better than the Wavy ones. However, the pretzel twists were thought to taste better than the rods.

The book was, in fact, right. Shapes do matter in foods, very much so.

NAME(s) **Emily Lyman** PROJECT NUMBER **S12**

SCHOOL Mater Christi GRADE 8

TEACHER Mark Pendergrass

PROJECT TITLE **Guilty?**

ABSTRACT

The purpose of this experiment was to determine how the reliability of eyewitness accounts change when witnesses are allowed to discuss what they saw with other witnesses. The hypothesis was as follows: if subjects are shown a crime scene video, then they will recall information more accurately when they are allowed to talk about what they saw.

While conducting research, it was determined that many long term memories are false. These memories are formed after people witness an event then try to recall what happened later on. Often, they only correctly remember a few details, so their brains automatically fill in false facts to complete the scene in their minds. Research also showed that narrative questions, which are questions that ask someone to describe something by themselves, are generally more accurate but less complete than controlled narrative questions, which ask for specific information.

The procedure for this experiment included collecting six groups and showing them the video. All groups waited a week before taking the test, but three groups had the chance to review the day after watching the video. The closing data for this experiment was collected when subjects took an exam. This test included both narrative and controlled narrative questions to ensure the most reliable answers.

Some observations taken during the experiment were that some subjects may have recognized the setting of the video and that people in the talking groups often convinced others to change their answers to the questions. After all testing was completed, the average test score for the talking groups was 31.06% and the average test score for the non talking groups was 50.2%, showing that eyewitnesses will give more reliable testimony if they do not talk about what they saw,proving the hypothesis wrong.

NAME(s) **Regan MacKay** PROJECT NUMBER **G03**

SCHOOL The Renaissance School GRADE 5

TEACHER Eve R. S. Dubois

PROJECT TITLE **Snowflakes!**

ABSTRACT

The question I have for my science fair project is, "How do Snowflakes form?" I came up with this question when it was the first snow of the winter. I was riding in the car with my mom and my two brothers. The snow was clumped together, sticking to the windows. If I looked really close, I could make out little snowflakes attached together. I asked my mom, ôHow do snowflakes form, Mom?ö She didn't know and told me to ask my teacher when I got to school. I asked my teacher, and she explained a little bit on how a snowflake forms. She told me if I was really interested, I could turn that question into a science fair project. And now look, I did.

Before I did my test, I made my hypothesis. My hypothesis was that all the snowflakes would be different. Snowflakes form by the way the wind blows, and the wind doesn't blow the same way. Well, maybe the wind blows the same way sometimes. But the snowflakes are in different positions, and some may be blocking the wind from other snowflakes, making only some snowflakes half built. These also may count as variables for my test.

My hypothesis was correct. All snowflakes are different. From the wind, the tree(s), and obstacle(s), snowflakes are different.

NAME(s) **Lindsey Marcy** PROJECT NUMBER **M04**

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

TEACHER Nate Morris

PROJECT TITLE **You've got a friend in me??**

ABSTRACT

For my science fair project, I was interested in seeing how safe my freshmen class was being on the internet, particularly Facebook. To do this, I created a fake Facebook account under the name of Nicole Hart. I added nothing more to her account than just simply a name. My purpose of this experiment was to see how many students would respond to such a request knowing nothing about the person. Also, how much information students were allowing the public to view. I then proceeded to go through a list of my class mates who had a Facebook and record what information I was able to retrieve from their profile. After doing this, I friend requested everyone who had an account. My hypothesis predicted that out of all my class members, only 35% of them would accept my request. I also predicted that the amount of personal information available to the public from the account would be small, meaning only a few would have all information visible. My results however were very different from my prediction. Out of the 85 members of the freshmen class who had Facebook accounts, 44 of the members accepted Nicole HartÆs friend request. Also, out of those 85 members, I was able to view 66 profiles with personal information visible to the public. Out of the 66 students who had personal information visible, 55 of those profiles had pictures, wall posts, information, and friends. Instead of my predicted 35%, I received about 52% acceptances from the freshmen class population. I also was able to view personal information from 66 of the 85 students in my class; about 78%: by no means a small amount as I had predicted. After viewing my results, some conclusions can be made. The major ones are this: the freshmen class population needs to be more careful with who they accept and what information they put out on the internet. Also, digital safety and awareness needs to be stressed more.

NAME(s) **Ben McCormick** PROJECT NUMBER **C11**

SCHOOL GRADE **8**

TEACHER Mary Ellen Varhue

PROJECT TITLE **Zip Zap Soil**

ABSTRACT

Healthy soil is needed for all plants to grow. I tested what the relationship was between soil nutrient level and soil conductivity. I chose this project to learn more about gardening, and soil. I wanted to see the relationship between what might seem like very different things. I wanted to see if the method of taking conductivity to measure nutrients works, and I also wanted to see which soil works the best with fertilizer. My hypothesis was that the method would work, and potting soil would grab on to the fertilizer the best.

○The first step is gathering all liquids, soils, and the meter you need. The soil types tested were clay, sand, silt and potting soil. Fill jars with the same amount of one soil, to one jar add just water, to another add half water and half fertilizer, and to the last add just fertilizer. Wait for 15 minutes to let soils create an electrolyte solution. Now, make sure your multimeter connects all the way from the copper wires to the meter. Now test the conductivity in milliamps, and record your data. Do this same test with all other soils. This test is meant to show that there is a correlation between soil conductivity and nutrient level. Now clean out the jars and do two more tests of each soil with just fertilizer. This test is meant to determine which soil type holds on to nutrients better. Record these tests and take averages of data.

○My conclusion is that the method of testing conductivity to see the amount of nutrients in a soil works. I can see that because numbers go up as I add fertilizer. Due to outliers in my data, I was unable to conclude anything about the best soil with fertilizer.

NAME(s) Robinson McCormick
PROJECT NUMBER P16
SCHOOL St. Francis Xavier School
GRADE 7
TEACHER Mary Ellen Varhue

PROJECT TITLE **Flash**

ABSTRACT

○My project uses three experiments to test which light bulb is the most efficient to use in your house for everyday life. My actual questions are which light bulb accumulates the most heat, which is the brightest, and which is the most cost efficient?
○ I chose this project because I have always enjoyed experimenting with light and electricity, so I decided to do an experiment combining the two. Initially, I could not decide what experiment I wanted to do. Then, I read a few articles concerning the ban of incandescent bulbs. I decided I would do an experiment to show the differences between L.E.D., C.F.L, and incandescent light bulbs.
○When I started my research I discovered that the technology behind the bulbs is about as different as can be. The C.F.L. bulb uses mercury gas and has an electric current run through it. The L.E.D. uses microscopic semi-conducting films and electrically moves electrons from film to film. The incandescent uses the classic wires in the glass bulb and heats them until the wires are glowing.
○ For the temperature test, I decided to experiment in the cold temperature outside, the warm temperature in my basement, and in my office with the gas heater turned on high. I did this to get the largest spread of data possible. I would turn the lamp on for three minutes and took a reading on my infrared thermometer every thirty seconds. I did this in each area for every bulb three times. For the brightness test, I did the same experiment but instead of an infrared thermometer I used a lux meter to take the readings.
○The incandescent was the hottest for the temperature test. The L.E.D. was the most cost efficient of the three bulbs, and the brightness test proved to be inconclusive.

NAME(s) Aiden McGrath
PROJECT NUMBER B36
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Garlic's Effect on Tomato Blight**

ABSTRACT

My independent project, GarlicÆs Effect on Tomato Blight, is testing to see if garlicÆs allelopathic abilities are able to fight off fungal diseases. The blight is a fungal disease known to effect several different types of tomatoes, potatoes and other vegetables. I hypothesized that the garlic spray would be most effective in killing and preventing the blight since garlicÆs allelopathy works best when the garlic is damaged.
○My procedure is to grow 60 tomato plants in Styrofoam cups. Twenty will be control plants, 20 will be plants treated will spray, and 20 will have garlic planted in the cup with the tomato. The independent variable in my project is how long the tomatoes are exposed to the blight, while the dependent variable is how much area the blight covers. My materials in this project are the different tomato plants, blight infested samples, garlic plants, garlic spray, grow lights, and the shelf they are stored on. To analyze my data, IÆm measuring how much area the blight is covering, using .5cm squares. The other component of my analysis is measuring the height to see if the treatment harmed the growth of the plant.
○From observations throughout the project, it seems as though growing the garlic right next to the tomato plants is preventing the most blight, although itÆs greatly hindering the growth of both plants.
○It appears that my hypothesis was wrong and that planting garlic in a garden works better than a spray.

NAME(s) **Connor McLenithan**

PROJECT NUMBER **G04**

SCHOOL South Burlington High School

GRADE **10**

TEACHER Curtis Belton

PROJECT TITLE **The Effects of Rising Acidity in Rain Water on Soil Erosion**

ABSTRACT

The purpose of this experiment was to test the effects of rising acidity levels in rain water on immediate soil erosion. It was hypothesized that there would be little to no immediate effect, as acidity in a fluid generally requires time to take effect. The procedures of this experiment began with the preparation of both the water, and the tray upon which the erosion will occur. The water should be prepared by filtering some form of acidifying material, in this case peat moss, through the liquid until the desired pH is reached. The tray was prepared by simply cutting out a section of the end of the tray and replacing it with cleaned chicken wire. Following this, a trench was dug using a pre-measured piece of wood, in this case a cut up wooden spatula. Next, the water was run down the trench, and gathered the eroding soil in a container placed at the end of the tray as to collect the run off water. Finally, tests were ran measuring the weight of water before and after erosion occurs, weight of soil before and after erosion occurs, and the amount of filtered soil, thus gathering the data. Preliminary data indicates that rising acidity in water will have little to no effect on immediate soil erosion. Currently the hypothesis is proving to be correct, however more data has yet to be gathered, and therefore there is still a chance for the hypothesis to be proven wrong.

NAME(s) **Mehgan McMullen**

PROJECT NUMBER **S13**

SCHOOL Northfield Middle High School

GRADE **11**

TEACHER Cynthia Tomczyk

PROJECT TITLE **The Effect of Age on Memory**

ABSTRACT

In this experiment I was testing to see if there was one number that was similar in each of the four age groups that was related to a significant date in history that was remembered in their memory. The 25 individuals in each of the four age groups (12-22, 27-37, 42-52, and 57-67 years old) chose however many random numbers they could list between 1 and 50 in 5 seconds. By having a time limit set will either cause the individuals to list numbers in numerical order or randomly. Ages 12-22 numbers 1-22 were highly chosen. Numbers 25, 28, 31, 34, 39, 42, 43, 44, 47 were all not chosen. AgeÆs 27-37 numbers 2-16 were highly chosen. Numbers 17-50 were chosen less than 4 times. Numbers 3, 19, 29, 35, 43 and 48 were all not chosen. Ages 42-52, numbers 1-22 were highly chosen. Numbers 23-50 were chosen less than 4 times. Numbers 27, 29, 43, 44, 46, and 48 were all not chosen. Ages 57-67, numbers 1-18 were highly chosen. Numbers19-50 were chosen less than 4 times with the no exceptions. Numbers 19, 38, 39, 43, 44, 45, 46 and 49 were all not chosen. Important patterns in my data showed that age group one had nine numbers that were not used, age group 2 had six numbers that werenÆt used, age group three had seven numbers that werenÆt used and age group four had eight numbers that werenÆt used. With the exception of age group one, a trend the data shows is an increase of numbers that arenÆt used as the ages increase. Perhaps with the (12-22) age group, the reason why they were the exception was because they only thought of numbers between 1 and 22 that fit their age group, instead of through 50.

NAME(s) Kurt McNamara, Alden Woodard, Maggie Wheel
PROJECT NUMBER GP02
SCHOOL Avalon Triumvirate Academy
GRADE 9
TEACHER Amanda Gifford

PROJECT TITLE **Common toxins from vehicles get tested on plants.**

ABSTRACT

It is known that a lot of substances that come from vehicles are harmful to plants. Substances like antifreeze, gas, and oil are things that you would find in the soil, on the side of the road, or in the water. It is believed that salt, gasoline, and oil will kill the plants and antifreeze will not affect them at all. The materials that were used were dirt, foam cups, mustard seeds, water, gas, antifreeze, oil. The plants were potted and let to grow for five days, then they were subjected to the toxins and observations were taken. It was observed that the plants in oil stopped growing when the oil was first introduced and are slowly dying, however the plants with gasoline and antifreeze died immediately when the toxin was introduced. In conclusion these things from cars are bad for the environment so it is extreamly important to take care of your vehicle to prevent the poisoning of plants.

NAME(s) Rachel Meagher
PROJECT NUMBER P17
SCHOOL Windsor High School
GRADE 11
TEACHER Jennifer Townsend

PROJECT TITLE **How Surfaces Affect the Flow Rate of Water**

ABSTRACT

The purpose of this experiment was to examine flow rates of water through tubes with different internal surfaces. I hypothesized that if the flow rate of water is related to the surface of the inside of the tube, then water will have the slowest rate of flow through the tube with a rough surface because that surface will create the most friction.

To examine the flow rate I attached three different tubes with different internal surfaces to the bottom of three buckets. I hung each bucket five feet above the ground and timed how long it took for two gallons of water to flow through each tube. The results showed that the tube with a rough internal surface and the tube with a smooth surface had approximately the same flow rate. The tube with the bumpy surface created the slowest flow rate of water, because these bumps were the biggest obstacles for the water. Water flow through tubes is related to the surface of the container it is flowing through. To better the efficiency of pipes in our homes and industries, we should use tubes with the smoothest internal surface possible.

NAME(s) David Melkumov

PROJECT NUMBER P18

SCHOOL The Renaissance School

GRADE 5

TEACHER Eve R. S. Dubois

PROJECT TITLE **Magnetic Strength in Heat and Cold**

ABSTRACT

My question is whether a magnet's strength is affected by temperature and if yes, does hot or cold enhance the power of a magnet and how much more power either one has than the other.

My hypothesis was that hot temperatures would enhance the power of the magnet because molecules inside the magnet are moving so fast that they go all around and have magnetic power in different parts, so it picks up the metallic objects.

My procedure was that I took three magnets of the same type and with one of them I put it in the boiling water. Next I took out the magnet from the boiling water and put it on top of 70 tacks and counted how many the magnet picked up. Then I took another magnet and put it in the freezer and waited five minutes and then took it out of freezer and put the magnet on top of the tacks and counted how many it picked it up. Next I took a magnet at room temperature and put it above the tacks and counted how many it picked up. Everything that was named above was done three times in a row and with the same exact magnet every time.

I found out that in three different trials their average was that boiling water did the worst, room temperature did okay, and the freezer did a very good job. In room temperature my average of 40 tacks, 55 tacks, and 59 tacks was 51 tacks. In boiling water my average of 21 tacks, 24 tacks, and 29 tacks was 25 tacks. In the freezer my average of 52 tacks, 63 tacks, and all 70 tacks was 62 tacks. This relates back to my original hypothesis because my hypothesis was that the heat would make the magnet stronger and cold would make it weaker, but was disproved because cold collected the most tacks possible at the end. I think this happened because when a magnet is heated, the thermal disorder is very large and low energy which causes the magnet to get weaker also because of the magnetic power being scrambled.

NAME(s) Abby Millard

PROJECT NUMBER B37

SCHOOL Windsor High School

GRADE 9

TEACHER Catherine Engwall

PROJECT TITLE **Plants and Acid Rain: Exploring the use of fertilizer to reduce negative effects**

ABSTRACT

The focus question was, does fertilizer prevent negative effects of acid rain on plants. Acid rain takes nutrients from the soil of plants. Fertilizer replaces the nutrients that acid rain took away from the soil. The hypothesis was, if kale is grown being watered with dilute sulfuric acid and treated with fertilizer, then it will not show the negative symptoms that the kale watered with only dilute sulfuric acid does, because farmers that use fertilizer do not see the effects of acid rain on their crops. Kale seeds were grown for six days. Four groups of plants were grown with four pots in each group. One group was watered with plain water and labeled control, another with sulfuric acid, another with acid and a small concentration of fertilizer, and another with acid and a large concentration of fertilizer. The largest plant in each pot was measured each day. The average height of the plants in each group was taken each day. The plants watered with acid were the tallest with an average final height of 43mm. The plants watered with a small concentration of fertilizer were 42.3mm. The control plants were 39.8mm and the plants watered with the large concentration of fertilizer were 33.5mm. The hypothesis was not supported. After further research, kale was found to be a plant that thrives in acidic soil. The fertilizer still counteracted the acid, making the soil less acidic, but this looks like a negative result because of the kale. If this experiment were to be performed again, a different plant would be used. The results of the experiment will let farmers know that kale can be grown in an area that is more susceptible to acid rain, but since they were somewhat inconclusive, the results of an improved experiment would be more applicable.

NAME(s) **Sonny Monteiro** PROJECT NUMBER **B38**

SCHOOL South Burlington High School GRADE **10**

TEACHER Curtis Belton

PROJECT TITLE **How Earthworm Affect Growth of Plants Through Non-point Source Pollution?**

ABSTRACT

○For the past week I have been completing my science project on non-point source pollution. In my hypothesis I stated that earthworms have a beneficial impact on the growth of plants though non-point source pollution because they help aerate the soil. In my experiment I have six houseplants. Three of them are part of the control group. The other three are part of the experimental group. My dependant variable is potting soil used for putting plants in pots. My independent variable is the earthworms in an environment of separate container of potting soil. I mix water with potting soil to simulate rainfall on soil. Then I water the plants with it simulating run-off pollution of soil that plants absorb during a storm. Then I record the heights of each plant and also a couple of daily observations. I have not finished data collection, but preliminary data indicates no impact or growth of the plants. I plan to record data over a time period of about 30 days. When my experiment concludes I plan to see some change in the experimental group.

NAME(s) **Sophia Moore-Smith** PROJECT NUMBER **B39**

SCHOOL Christ the King School GRADE **6**

TEACHER Mrs. Amy Wright

PROJECT TITLE **Does What You Eat For Breakfast Affect School Performance?**

ABSTRACT

Throughout the ages, Moms have said to eat your breakfast so that youÆll do well in school. My science project studied if what you eat for breakfast affects school performance.

Forty-four student test subjects ate breakfast at home. I administered identical ten question IQ tests which each student had five minutes to complete and record what they had for breakfast.

Test results were separated into three categories: cereal, no breakfast, and bread product (i.e. waffle, toast, or pancake).

I had hypothesized that students who ate a bread product would perform best. I thought this because bread contains fiber to sustain energy and fullness.

Students who ate cereal had the highest test scores with an average score of 53 points. I think this happened because bread and cereal are very similar in carbohydrates, fiber, and protein. Subjects who ate bread products actually did the worst, with an average score of 50 points. Subjects who didnÆt eat anything had an average score of 52 points. However, the different food category averages were very close, perhaps because anyone can perform well on a five minute test.

If I could do this experiment again, I would increase the number of students tested to for a more accurate data set. I would have more questions on the test and longer test duration. This would give more reliable information about which breakfast foods provide better energy in order to concentrate throughout the school morning. Another idea would be to have the subjects take the test after doing a strenuous, calorie-burning activity, such as physical education class or conduct the test later in the morning. I would also separate the breakfast foods into more distinct nutritional categories, such as protein, carbohydrate, fruit, and no breakfast.

NAME(s) **Olivia Morana** PROJECT NUMBER **B40**

SCHOOL St Mary's School GRADE 5

TEACHER Melissa Caligiuri

PROJECT TITLE **To Dine or Not To Dine?**

ABSTRACT

I have always loved watching, feeding, and drawing birds, and this year my science fair project is based on this interest. My project is called ôTo Dine, or Not to Dineö. I chose this name for my project because I am studying how much birds eat based on weather factors. The factors that I recorded were temperature, cloudiness, wind, sun, precipitation, and phase of the moon.

For background research, I used the internet, some books and I spoke with employees at a local feed store. On the internet I found pictures of different birds, what kind of food they like to eat, types of bird feeders, and weather factors. I read a few books about bird watching at the library. I made a trip to a local feed store and the workers there were very nice, and helped me find the correct bird feeders and bird seed.

In order to conduct this study, I placed two cylindrical bird feeders in our back yard. I chose to use cylindrical bird feeders because it would be easy to accurately measure the amount of food eaten using a ruler. One of the feeders was designed for small seeds for small birds and the other for larger seed for larger birds. Based on my research I selected the correct type of seed for each feeder. Every day I recorded all of the weather conditions and environmental factors listed above and measured how much food was eaten from each feeder.

Based on the results of my study, my conclusion is that birds do not like to eat much when it is raining or windy. This was true for both small birds and large birds. Birds ate the most on calm, sunny days. Temperature and moon phase did not affect how much the birds ate.

NAME(s) **Caleb Morehouse** PROJECT NUMBER **S14**

SCHOOL The Renaissance School GRADE 6

TEACHER Eve R. S. Dubois

PROJECT TITLE **Smiles: real or fake?**

ABSTRACT

My science fair project is on smiles and whether people can tell the difference between real and fake smiles. I became interested when I saw the question on a website built to help people in schools come up with science fair projects. I became even more interested when I saw that my question, "Can people tell the difference between real and fake smiles and what variables may affect how well they can?" hadn't been answered completely yet. It's a hobby of mine to ponder the answers to complex questions. I guess I just like questions that haven't been 100% answered yet.

After my background research was conducted, I began to ponder the question for a long time and found myself devising a project that would become my science fair project and an opportunity to increase the people's knowledge of the subject of real and fake smiles. My now fledged science fair project is shown today at the science fair.

Now to my hypothesis: my hypothesis is that older women will have the highest scores due to the fact that older people have more practice, right? And women are stereotypically considered to be more of "people people" so there must be some truth in stereotypical views, right?
Procedures next: I found 26 random test subjects and asked them to fill in a sheet asking questions such as: Please rate your general outlook on life on a 1 to 7 scale, 1 being optimistic. Then they were asked to complete an online quiz containing 20 videos of people smiling and the question below it stating "Is this smile real or fake?" You were allowed to answer yes or no and were given your score at the end of the test.

In conclusion, in general my hypothesis was partially proven: women had an average of 14.25 and men 12.6. However, the variable of age seemed to be close to irrelevant and older people had a very slight advantage in the test. I was surprised they didn't have a huge advantage!

NAME(s) Madeleine Morse
PROJECT NUMBER B41
SCHOOL Weathersfield School
GRADE 8
TEACHER David E. Lambert

PROJECT TITLE **The effects of different amounts of carbon dioxide on plants**

ABSTRACT

The problem I chose was if plants with higher carbon dioxide levels would grow faster and thrive better than plants exposed to the normal amounts of carbon dioxide that is in the air. I chose this because there is a lot of fuss over pollution lately and carbon dioxide is pollution, so I wanted to see what effects it would have on plants and how plants would respond to excess levels of carbon dioxide. Plants require three things to make food by way of photosynthesis. Those three things are sunlight, water, and carbon dioxide. Since plants require carbon dioxide to make food I thought that plants exposed to higher levels of carbon dioxide would grow faster and thrive better because they could make more food.

○For my experiment I took three jars and planted a bean seed in them, I then let the plants grow for nine days before I exposed them to higher amounts of carbon dioxide because I thought I would get better results and would be able to see if the plants would wilt and slow their growth or if they would grow faster. After nine days I put the plants in the different amounts of carbon dioxide I decided upon. Jar number one was the control plant so it was exposed to the normal amount of carbon dioxide that is in the air. Jar number two had fifty percent carbon dioxide and jar number three had one-hundred percent carbon dioxide. To simulate one-hundred percent carbon dioxide I let a candle burn in jar number three until it burned out which took 1:01.90 minutes. To simulate fifty percent carbon dioxide I let the candle burn in jar number two for half the time it did in jar number three which was 30.95 seconds. Then I measured the height of the plant and how many leaves it had every day for seven days. During my experiment I observed that the plants exposed to higher levels of carbon dioxide (jars two and three) grew much faster and were a vibrant green while the plant in jar number one grew slower and was a duller, yellowish green.

○In conclusion my hypothesis that plants in higher levels of carbon dioxide would grow faster and thrive better than plants in lower amounts was supported.

○As I was doing my experiment I also wondered how different amounts of sunlight and water a plant gets would affect its growth.

NAME(s) Basundhara Mukherjee
PROJECT NUMBER B42
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **The Effectiveness of BioSand Filters on Filtration and Disinfection of Drinking Water**

ABSTRACT

The purpose of this experiment was to determine whether different flow rates in a sand filter account for significant differences in filtration and disinfection of water. Graduate student Rebecca Tharp of the University of Vermont highlights the usage of BioSand filters for water purification in her graduate thesis. In conducting this experiment, it is hypothesized that a slower flow rate will purify water more effectively, as the sand will pick up smaller particles in the water.

The control group in this experiment consisted of two filters with one liter of water added to the reservoir. The dependent variable is turbidity and percentage of bacteria of the water sample, while the independent variable is number of liters of water being added. Prior to experimentation, the turbidity, using a turbidometer, and bacteria percentage, using the method of streaking and observing, of the water will be determined. After purification, the water will again be tested for both turbidity and bacteria percentage.

Data collection is incomplete at the moment; however, it is expected that a slower flow rate will purify water more effectively. The data will initially be analyzed to discover any significant changes in the turbidity and bacteria percentage from pre-experimentation to post-experimentation. Furthermore, the analysis will observe factors appropriate for usage in developing countries, such as cost, time-efficiency, accessibility, and effectiveness.

New discoveries about the BioSand filter can promote it to be one of the most effective purification methods in developing countries.

NAME(s) **Sam Myers** PROJECT NUMBER **P19**

SCHOOL St. Francis Xavier School GRADE **8**

TEACHER Mary Ellen Varhue

PROJECT TITLE **Green Roof**

ABSTRACT

Solar cells can be affected by overheating of the roofing they are on and by the amount or extent of ventilation they have.

My project was testing which roofing material would have the best effect on solar cells and which form of ventilation would work best.

My hypothesis was that the terracotta roofing would perform the best and the forced ventilation would be the best.

My procedure was to setup the different roofing materials under a heat lamp with the solar panel flat on it. The tests would last thirty minutes and before starting I would let the heat lamp heat up to eighty degrees Fahrenheit. In the case of ventilation test I used two wooden blocks to give the cell ventilation and in the forced ventilation test I used the wooden blocks plus I used a fan to force ventilate the cell. I put each type of roofing through all three ventilation setups. During the tests I would take a temperature reading at the zero-minute mark, the fifteen-minute mark and at the thirty-minute mark. I also took voltage readings at the zero, fifteen, and thirty-minute marks.

My results showed the terracotta roofing heated up the slowest which made the cell perform best. I also found that the metal roofing heated up fastest which made the cell perform the worst. Also the forced ventilation allowed the cells to perform the best because it stopped them from overheating.

I concluded that my hypothesis was mostly correct. However, forced ventilation may not be the best because of it consumes energy. This lead me to believe that solar cells perform best when on terracotta roofing and when they have only a ventilation gap, not a cooling system.

NAME(s) **Chris Neimeth** PROJECT NUMBER **S15**

SCHOOL Mater Christi School GRADE **6**

TEACHER Mark Pendergrass

PROJECT TITLE **Age and Accuracy Change?**

ABSTRACT

Abstract

○The purpose of this project was to see if your spelling and grammar improved as people get older. It was Hypothesized that your accuracy will get better as you get older but once your mind starts to loose its memory then your accuracy in spelling and grammar will become worse. A reason for the Hypothesis is a discovery that your memory gets worse once you get to a certain age but this age can be different from person to person. This is proven to cause spelling and grammar mistakes. The project confirmed accuracy by making sure the people tested werenÆt tired. The people tested also used the same two sentences and the same amount of time of two minutes.

○In the project there were 14 people tested, the people tested were from the ages of six to eighty. This offered a large variety of ages. All the people tested remained anominous during the study. The conclusion of the study was that the accuracy of your writing does get better as you get older but with lots of up periods and down periods. The Hypothesis was correct but to it was a lot more specific to the person rather than the age of the person. Other factors besides age played a much bigger role than the Hypothesis for this project expected.

NAME(s) Lisa Ogorzalek
PROJECT NUMBER P20
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **Musical Water Glasses**

ABSTRACT

Many people have heard the musical sound of a wet finger twirling around the rim of a glass. How can different pitches or notes come from that glass? In my experiment, I tested the effect the volume of water in a glass has on the pitch of the note produced.

○I thought that if I filled a glass with more water, the pitch and frequency would become higher. To test my hypothesis, I calculated the volume of the glass. The amount of water in the glass was my independent variable; the pitch was my dependent variable. For my control, I wet my fingertip and recorded the note produced using a chromatic tuner. To determine the frequency, I used a piano to match the octave of the note. I used a table of note frequencies to establish the frequency. I tested progressively one more ounce to calculate where the note changed pitch.

○As a variation on this procedure, I used four other different sized glasses to see that if I had a constant amount of water, the pitch would change depending on the size of the glass. I followed the same procedure above, with four extra glasses.

○After testing, my hypothesis was incorrect. For the first part of my experiment, the frequency actually lowered. The note's pitch became lower as the volume of water in the glass increased. For the second part of my experiment, there was no relation when I tested the same amount of water in different sized glasses. The results were similar to the first procedure, with the pitches falling steadily as the glass became fuller.

○Overall, I met my objective, which was to determine how the change of volume affects pitch. Higher volume makes the object vibrate slower, which will therefore create a lower sound.

NAME(s) Sara Ogorzalek
PROJECT NUMBER P21
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **Radiating Cell Phones?**

ABSTRACT

Every day millions of people talk and text on cell phones. There have been numerous studies regarding cellular phones and possible effects of radiation to oneÆs brain. If radiation is found, it may change how one lives his or her daily life. A cell phone, which keeps everyone connected and current, is an important device in everyoneÆs life. Without it, communicating with one another would be difficult. But would you sacrifice potential health issues in order to use your cell phone?

○I investigated the potential radiation emissions from cell phones. I predicted that there was going to be some radiation, but not enough to matter. I tested three different cell phones for microwave radiation using a digital microwave radiation detector. I set them up in a manner so that there was nothing to obstruct the microwaves being emitted.

○Overall, my findings were somewhat expected. I measured the microwave radiation in the units of milliwatts per square centimeter. Using these units, the Federal guidelines set by the Department of Health and Human Services state that the maximum allowable leakage is 5. This isnÆt necessarily dangerous, but should be cautioned. I observed through my tests that the closer I am to the phone, the higher the radiation is in call mode. Radiation is higher in text mode versus call mode. I received numbers as high as 9.83, and as low as 0.00.

○In conclusion, cell phones do give off radiation, but not enough for one to worry about causing health issues. However, people should learn to turn a cell phone off when not in use, especially at night. Cell phones should not be at oneÆs ear all day. I feel this project has helped me be more aware of what is going on when I receive text messages or phone calls.

NAME(s) Tristan Ohlson
PROJECT NUMBER B43
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **The Inhibitory Effects of Allium vineale (Garlic) on Oscillatoria (Cyanobacteria)**

ABSTRACT

This experiment addresses problems that bodies of freshwater, including Lake Champlain, have faced in the past and present with cyanobacteria and algae blooms. To confront these issues in a scientific way, cultures of cyanobacteria will be grown and exposed to a solution of garlic, a natural antibiotic. First the cultures must be grown so as to be more measurable. Following this, monitoring of the density and growth of the algae is paramount. Once all but the control group cultures are exposed to the garlic solution, the growth will be closely monitored over a period of time. Although the data collection is not completed, thus preventing any conclusions to be drawn, it is expected that the garlic solution will inhibit the algae growth. If this hypothesis was to be proven correct, there would have to be noticeable and measurable inhibition of growth in the cultures exposed to the garlic mixture.

NAME(s) Caleb Oliveira
PROJECT NUMBER G05
SCHOOL The Renaissance School
GRADE 5
TEACHER Eve R. S. Dubois

PROJECT TITLE **Dissolved Oxygen in the Lake**

ABSTRACT

I am trying to find out what affects dissolved oxygen in Shelburne Bay and a local stream: rain with cold and warm water, snow with warm and cold water, and sunny day with warm and cold water. I think there will be more dissolved oxygen in the rain with cold water because it will be cold, so the water air molecules will clump together and cause less movement and less evaporation. The rain will cause splashes, so oxygen will be caught and brought under the water. I think the second highest dissolved oxygen water level will be the warm and rain water. The rain will still make splashes that will catch oxygen even though there will be evaporation. I predict that the third highest will be snow and cold water because the snow will make small ripples in the water that will capture oxygen and cause less evaporation since it is cold. The next one will be snow and warm for the same reason as snow and cold, except there will be more evaporation. I think the fifth highest will be sunny and cold because there will be little evaporation because of the cold. I think the lowest will be sunny and warm because there will be no splashing (other than the waves at Shelburne Bay and the splashes in the stream) to catch oxygen, and there will be evaporation because it will be warm.

If you want to try this experiment, here is the procedure:

ò○Buy dissolved oxygen kit.
ò○Go to lake on cold and sunny day.
ò○Take water test.
ò○Get a second sample from the lake and let it warm up.
ò○Test the warm water.
ò○Repeat with the stream water.
ò○Go to lake on a rainy and cold day.
ò○Take water test.
ò○Get a second sample and let it warm up.
ò○Test the warm water.
ò○Repeat for snowy day.

NAME(s) Emmalee Osborne
PROJECT NUMBER B44
SCHOOL Northfield Middle High School
GRADE 11
TEACHER Cynthia Tomczyk

PROJECT TITLE **The Effect of different concentrations of Methylparaben (Mold Inhibitor) on the Growth of**

ABSTRACT

This labÆs purpose is to show the effect of Methylparaben on the growth of mold over three weeks. The main hypothesis is if we increase the concentration of Methylparaben, then the growth of mold will be inhibited, because Methylparaben is a preservative used against molds, compared to mold with no Methylparaben in it. The data was acquired by swabbing house mold from an opening of the floor boards onto Petri dishes, then applying various concentrations of Methylparaben on the mold samples. The samples would go in an incubator that keeps the environment a stable 37 degrees Celsius. Every week, for three weeks, the moldÆs surface area growth is counted using Petri graphs. The Petri graphs are placed over the Petri dishes and wherever mold was it would be shaded in, on the Petri graph. The Petri graph helps calculate the surface area of the mold by counting how many squares are shaded, represent mold growth. Find the average growth for each week for each concentration. This is done for the other 3 concentrations of mold inhibitor. The percent change for mold growth is calculated and compared. The average mold growth for weeks one, two, and, three for the mold for the various concentrations of Methylparaben was: 25 cm squared, 24 cm squared, and 31 cm squared (0 percent), 22 cm squared, 20 cm squared, 12 cm squared (10 percent), 24 cm squared, 21 cm squared, 15 cm (25 percent) squared, 15 cm squared, 15 cm squared, and 7 cm squared (40 percent), consecutively. The percent change for 0, 10, 25, and 40 percent Methylparaben was 24, -45, -37, and -53 percent, consecutively. Each negative number represents a negative percent change. The data showed that as the concentrations of Methylparaben increased, the growth of the mold decreased over the three weeks.

NAME(s) Markie Palermo
PROJECT NUMBER B45
SCHOOL Essex High School
GRADE 11
TEACHER Mr. Adam Weiss

PROJECT TITLE **Genetic Analysis of Brown, Brook, and Tiger Trout Populations in the Lake Champlain Basin**

ABSTRACT

The purpose of this pilot project was to assess native brook trout (Salvelinus fontinalis), Vermont State fish, and non-native brown trout (Salmo trutta) populations in the Lake Champlain Basin using six genetic markers. One concern was that the brook trout populations were declining due to the hypothesized mating of female brook trout with male brown trout, thus producing a sterile hybrid tiger trout (Salmo trutta X Salvelinus fontinalis). This would subsequently threaten the longevity of the native brook trout species. A second hypothesis was that the further apart the test sites, the greater the genetic diversity within the trout populations.

The DNA of each of the species of trout caught was tested to determine whether the suspected hybridization was in fact occurring. DNA samples were taken from adipose or caudal fin clippings through live capture and safe release at various locations in the Lake Champlain Basin. Furthermore, GPS coordinates were determined for each site; the length of each trout was measured; and water and air temperatures were recorded.

In conclusion, genetic testing of the trout samples was done to determine if and where this hybridization had occurred, and to verify the diversity of the trout populations. Both hypotheses were supported. The results showed that the proposed tiger trout had DNA alleles that were consistent with both brook and brown trout together. Additionally, phylogenetic tree analysis using DNA sequences maintained these findings as well as confirmed the increase of genetic diversity between the test sites. Data produced from this project can contribute to planning decisions and protection of habitat thus contributing to a healthy eco-system. Finally, last yearÆs record snowfall, rainfall and tropical storm Irene had a destructive impact on the trout populations, making this study even more important.

NAME(s) **Stella Pappas**

PROJECT NUMBER **P22**

SCHOOL The Renaissance School

GRADE 5

TEACHER Eve R. S. Dubois

PROJECT TITLE **Whatever Floats Your Boat**

ABSTRACT

The purpose of this project was to determine what shaped boat carries the most weight. I created two different shaped boats out of tin foil (flat bottomed and v-shaped) that could carry the same volume of water. My hypothesis was that the flat bottomed boat would hold more pennies than the V-shaped boat. After placing the boats in water, I added pennies until they sank. I did this three times and calculated the average number of pennies. My results showed that the flat bottomed boat carried the most pennies.

NAME(s) **Gailin Pease**

PROJECT NUMBER **B46**

SCHOOL Windsor High School

GRADE 10

TEACHER Jennifer Townsend

PROJECT TITLE **The Effect of Aspirin on Cellular Respiration in Yeast**

ABSTRACT

The effect of aspirin on cellular respiration in the common cooking yeast, S. cerevisiae, was measured by placing the yeast in a 7.7 percent sucrose solution and comparing bubble depth and balloon circumference, two indicators of how much gas had been produced, between the vials with aspirin and the vials without aspirin. It was hypothesized that cellular respiration would decrease in vials with aspirin because aspirin has many other negative effects on yeast, and the rate of cellular respiration can be affected by outside stimuli. Aspirin greatly lowered the rate of cellular respiration over the course of both one hour and over 6 hours. However, this was likely caused at least in part by apoptosis caused by the aspirin, not a decrease in mitochondrial function. This shows that aspirin does have negative effects on yeast, however, further research should be done on what was causing the decrease in cellular respiration, whether it was a decrease in mitochondrial function or an increase in apoptosis. If aspirin does cause a decrease in cellular respiration, this could have real world applications in designing medications which do not disrupt cellular respiration to lessen side effects, or to develop drugs which target cellular respiration to treat illness.

NAME(s) **Josh Pendleton** PROJECT NUMBER **P23**

SCHOOL GRADE **11**

TEACHER Jody Sabataso

PROJECT TITLE **Shutter Speed**

ABSTRACT

Abstract

○The purpose of this experiment is to utilize the camera settings to get the desired quality or type of picture you want, with different scenarios of lighting. Throughout the process, I have taken well over 500 pictures, changing the settings each time by the minimal amounts. This was all to get the right exposure along with timing. I started off by recruiting one of my friends to be a test subject so I could get the basic idea of what kind of image I was looking for. After this shoot was over I decided to use him for the final shoot, and then we set a location and time of the final shoot. Once the date snuck up on me I set up all the light stands and curtains. This tool about 45 minutes to set up. After tweaking the lighting so that the subject was lit almost to perfection, I made sure all the lights were locked and very stable. I set up the camera and made sure that it was fully charged. The composition of the shot was set, and it was time to start. After about one hour or an hour and half I got the 5 images that I wanted to use. After I got to see the pictures on the computer I realized how much different you can change the image by changing the lighting. The higher ISO, the grainier it would be, and the opposite of that. Some of the coolest ones were the stopped motion and the blurred motion. I actually loved doing this science fair and taught me a lot about different ways to use the lighting I have around me.

NAME(s) **Zachary Phelps** PROJECT NUMBER **P24**

SCHOOL Rutland High School GRADE **11**

TEACHER Dawn Adams

PROJECT TITLE **Crazy Craters**

ABSTRACT

The purpose of this experiment is to test that the surface tension of water can slow down an extraterrestrial object so that it does not cause as much damage if there were no water present. If one were to fill a mini swimming pool with sand and water, and drop five different sized objects of different masses into the sand and water, then measure the crater depth in the sand that is under the water. It should not be as deep as if one were to drop the object into just sand because of the rapid deceleration of the object due to the surface tension of the water. To find the exact crater depth one would drop five different objects of different mass into a mini pool filled with paverÆs sand to get a perfect concave that could be measured. After performing the procedure the crater size difference from just dropping the object in sand to then adding water and dropping it was cut in half. The sample with the water had a crater size almost exactly half of the sample with no water. This science experiment comes up with a clear view of what would happen if an asteroid of a large proportion were to hit the earth. The hypothesis was fully proved and the design, in terms of getting accurate results, worked great.

NAME(s) **Lauren Phillips**

PROJECT NUMBER **C12**

SCHOOL Rutland High School

GRADE 11

TEACHER Dawn Adams

PROJECT TITLE **Fabric Frenzy**

ABSTRACT

Lauren Phillips

The purpose of this experiment was to see how well different types of fabric held on to fiber reactive dye. My hypothesis was if a fabric is cellulose-based it will hold on to the dye better and have a richer color than if the fabric was completely synthetic (with no cellulose). To do this I bought purple fiber reactive dye and several different types of fabric: cotton, polyester, rayon, nylon, and a cotton/polyester blend. I then soaked samples of each fabric in the dye after it had been mixed. I washed them and let them dry and measured their hue, saturation, and brightness. The conclusion I obtained was that rayon (a cellulose-based fiber) had the darkest, richest color. It had high saturation levels over 90%, which showed that the purple dye stayed very true to color. Nylon (a synthetic blend with no cellulose) absorbed the least amount of the dye and turned a light baby blue, not a deep purple. This project shows that fiber reactive dye works best with cellulose-based fibers and it should not be used for dying materials that do not contain cellulose because the dye will not adhere to the fabric.

NAME(s) **Cameron Pierce**

PROJECT NUMBER **C13**

SCHOOL Rutland High School

GRADE 11

TEACHER Ann Marie Mahar

PROJECT TITLE **The Effect of Temperature on Primary-Cell Battery Duration**

ABSTRACT

With energy consumption in the world rising, there is a greater need for efficiency. Invaluable to the future of such things as electric cars, computers, and phones is battery power. The purpose of this project was to test common batteries and view the mathematical relationships between temperature and duration. The hypothesis tested was that batteries closer to room temperature will perform longer. In the procedure, three brands of AA batteries were connected to a fan to discharge where they could be timed and have their voltages recorded at regular intervals. This was done at three different temperature conditions: -80°C, 0°C, and 23°C. The independent variables were the type of battery and temperature whereas the dependent variables were the time taken to run out of charge and voltages that were produced. Held constant was the power of the device and size of the batteries. The data points formed from temperature as the x-value and time as the y-value resembled an exponential graph rather than linear. An exponential regression was calculated to represent time as a function of temperature, where the temperature variable could be substituted in for. From there, the regressions were differentiated to find that the greatest rate of change occurred at room temperature, meaning that as the temperature decreases, the most noticeable change in time will occur directly below room temperature. To use Duracell as an example, the batteries lasted about 170 minutes less at -80°C than at 23°C. In addition, other conclusions were drawn. In all conditions, Duracell was the best battery in terms of duration, and voltage readings decreased on a linear path.

NAME(s) **Maria Pierson** PROJECT NUMBER **P25**

SCHOOL Folsom Community Educational Center GRADE 7

TEACHER Paul Fitzgerald

PROJECT TITLE **Building A Better Wheelchair**

ABSTRACT

What if a robotic wheelchair could automatically help a disabled person easily move around at home? The purpose of this project is to invent a wheelchair controls so that the wheelchair will stop before hitting a wall, and will avoid falling down any flight of stairs. A lego mindstorms robotic kit was used to design, develop and test controls that could be placed on a wheelchair to allow for safe travel. After many attempts, a combination of robot design and programming was found fro successful results. The final robot design was able to make a warning sound, stop at a wall or stop before falling down a flight of stairs and safely reverse direction. A future improvement would be for these robotic controls to have voice command to that when a disabled person says something, the robot can do it.

NAME(s) **Zach Piper** PROJECT NUMBER **B47**

SCHOOL South Burlington High School GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **How Sound Affects Plant Growth**

ABSTRACT

The purpose of this experiment is to test whether sound has any affect on plant growth and if so, how much. The goal is to use the results and use the strategies that I will learn to possibly grow better, and stronger plants in the future. I will grow nine ivy plants, three with quiet surroundings, three with classical music played to them 5 minutes per day, and three with rap music played to them for 5 minutes per day. The plants will have equal water and equal distribution of sunlight. In my early research, which has only been a couple of days, it appears that when my results come back, that the plants will have grown to roughly the same size. All variations will most likely be genetic variation although the experiment is early and data could change at any point thought tout the collection. I hope my results continue to follow this pattern because then my hypothesis will be correct. I believe the sound will have no impact on the plants and all will grow as they would regularly.

NAME(s) Connor Plante
PROJECT NUMBER B48
SCHOOL Mater Christi
GRADE 8
TEACHER Mark Pendergrass

PROJECT TITLE **DOES VIDEO GAMING INFLUENCE ONES SURGICAL SKILLSET?**

ABSTRACT

QUESTION: The purpose of this study was to determine if individuals who play more video games demonstrate greater technical surgical abilities than those who do not play as much.
HYPOTHESIS: If an individual engages in electronic gaming, then his/her scores on surgical tests of technical ability will be greater than that of someone who does not engage in video gaming.
RESEARCH: Background research determined that robotic surgery is an increasingly used minimally invasive form of surgery. Also discovered was that hand-eye coordination is important to coordinate the information received through the eyes in controlling and guiding oneÆs hands to accomplish a task. Previous studies exist that have looked at the correlation of video gaming experience to psychomotor skills.
PROCEDURE: Test subjects were administered a questionnaire to determine the time they spend playing video games per week. Subjects were grouped into those who play 0 û 2 hours, 3 û 5 hours and > 5 hours of video games per week. Three simulation tests were administered to the study participants: a laparoscopic test, a robotic test, and a bronchoscopy test. For each participant, each test was timed and the bronchoscopy test also scored. The test results were correlated to reported video game playing times.
CONCLUSION: Overall, subjects who play more video games had better times on the robotic simulation test. Subjects who play less video games had better times on the laparoscopic simulation test and better scores on the bronchoscopy test. Both groups had the same average time on the bronchoscopy test.

NAME(s) Matilda Plumb, Hunter Griffin-Barnes
PROJECT NUMBER GP04
SCHOOL Avalon Triumvirate Academy
GRADE 9
TEACHER Amanda Gifford

PROJECT TITLE **Effects of household chemicals on radish growth**

ABSTRACT

In testing the effects of common household chemicals on radish growth, it is thought that most will die shortly or not sprout at all. Two separate groups were planted with eight cups each, with two radish seeds in each cup. Half a tablespoon of common household chemicals were added into the potting soil during planting the seeds, for each cup. Plants were watered once every two days with normal water. After the first dose of chemicals no more were added. To determine if they would sprout living in the chemicals, and if they did how long they would live. (Many of them took longer to sprout, while others sprouted quickly and/or at a normal pace). Some of them looked shriveled up, and many others look well and lively. Others died slowly after planting, and are now nothing but soil left in the cup. The chemicals are the most likely factor to kill them due to the pattern of the plants death. If both sets of seeds died it is more than likely that the chemicals are the cause of death. The chemicals also stunted many growths, and/or slowly poisoned them killing them after sprouting. Some of the chemicals had no effect on the plants growth. These are a wide range of results so the original hypothesis is somewhat correct. In conclusion six out of the sixteen did not grow, and eight of the plants died.

NAME(s) Vignesh Rajendran

PROJECT NUMBER B49

SCHOOL Essex Highschool

GRADE 9

TEACHER Mark Paul

PROJECT TITLE **Comparisons of the Growth of Pink Oyster Mushrooms on a Straw Medium or a Cow Bio-Digest M**

ABSTRACT

The purpose of this experiment was to determine which of the three substrates was more effective for growing pink oyster mushrooms: 100% cow biosolids, 50/50 (v/v) blend of cow biosolids and straw, and 100% straw. Straw has been used to grow mushrooms for hundreds of years. It is light and airy to let the mushrooms respire, provides an ample source of carbohydrates needed for fungal growth, and also holds sufficient water to maintain a damp environment which the mushrooms require to thrive. Biosolids are one of the by-products of anaerobic digestion of cow manure that has been heated to make biogas. Every year 6.9 million tons of biosolids are produced. Biosolids have very high nutrient content that could potentially improve mushroom growth. When combining the nutritional value of the biosolids and the optimal moisture holding/aeration conditions of the straw in a 50/50 blend, the environment should be perfect for pink oyster mushrooms to flourish.

In our first trial, we constructed a chamber to grow the mushrooms in a high humidity environment. Unfortunately, we could not rely on the results of this study due to contamination of the experiment by fungus gnats that adversely affected the growth of the mushrooms in this chamber. Therefore using aseptic techniques, pink oyster mushroom mycelium was introduced to the same media substrates as the original study but was conducted in small enclosed Magenta boxes. The boxes were placed in an incubator at optimal temperature for fungal growth and were evaluated weekly for the presence of sporulating fungal bodies. Four weeks after inoculation, the 100% straw medium began to develop pink sporulating mushrooms while the 50/50 blend did not show any mushrooms until five weeks after inoculation. The 100% cow biosolids never produced any sporulating mushroom structures although fungal mycelium was evident throughout the medium.

NAME(s) Cody Rankin

PROJECT NUMBER P26

SCHOOL Rutland HIgh School

GRADE 10

TEACHER debra hathaway

PROJECT TITLE **The Velocity of Waves**

ABSTRACT

During the experiment a rock was dropped into a large tank of water. At each test more water was added to see if the speed of the wave changed depending on the depth of the water. The hypothesis was that waves will travel faster in deeper water. After following the procedure and recording the data the hypothesis was proven to be correct. As waves travel on top of each other they create friction between the bottom. The deeper the water the more distance between the bottom and the wave, so the wave is able to travel much faster because of the decrease in friction.

NAME(s) **Dawn Rauch**

PROJECT NUMBER **S16**

SCHOOL Rutland High School

GRADE 11

TEACHER Dawn Adams

PROJECT TITLE **Just Clowning Around**

ABSTRACT

The purpose of the experiment is to determine how inattentional blindness affects people in an everyday situation. Inattentional blindness occurs when ones attention is focused on one thing and the brain misses a major change or event in the environment. This can relate to texting while driving, or other dangerous situations that can cause death because people are trying to multi-task. If instead of trying to make the brain focus ineffectively on several things, people need to focus on only one thing at a time.

○If a personÆs attention is focused on doing a task, then their brain will miss the unexpected objects, changes, or events in the environment around them because the brain will be so focused on just one task. The brain will be able to filter out all the information that is received from the senses, and the attention will be kept only on the task.

○To prove this hypothesis, a participant read simple math problems off a board while a clown walked directly by the participant.

○Not one participant noticed the clown. 100% of the people tested admitted they did not notice the clown walk by while doing the math problems, even though some of them had previously seen the clown and some participants had known a person was walking by.

○This project shows the brainÆs inability to multi-task, and the project shows how efficient the brain is at one thing. This also proves that the brain is able to prioritize the information received from the senses.

NAME(s) **Aaron Rhodes**

PROJECT NUMBER **P27**

SCHOOL Rutland High School

GRADE 11

TEACHER Dawn Adams

PROJECT TITLE **Bunt Ballin'**

ABSTRACT

The purpose of doing this experiment was to find out if a BESR (ball exit speed ratio) bat could hit a baseball further than a BBCOR (batted ball coefficient of restitution) bat and a wood bat. This is important to anyone who plays or watches baseball. BESR bats have been made illegal because they are said to have too much trampoline effect. In this experiment, a baseball was bunted with all three types of bat from a pitch at a constant speed. The hypothesis stated that the BESR bat would bunt the baseball the furthest because it has the most trampoline effect of the three types of bats. After completing the experiments average distances for each bat type was taken. The BESR bat had the furthest distance, followed by the BBCOR bat, and then the wood bat. This project proved the hypothesis correct in saying that the BESR bat would bunt the ball the furthest because it has the most trampoline effect.

NAME(s) Hunter Riehle
PROJECT NUMBER G06
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Ski Area Run off and Water Quality**

ABSTRACT

The purpose of my project was to determine the difference of water quality in ski area run off, versus undisturbed mountainous terrain runoff, specifically turbidity levels. I predicted that the levels of turbidity would be higher in ski area run off, as deforestation had lead to higher rates of erosion in those areas than areas with little to none deforestation activities. Evidence of deforestations effect on soil loss and erosion can be seen all over the world. One notable example of this occurrence is the Yellow River in China. In order for the data to back up and reinforce my hypothesis, the results would have to indicate that the turbidity levels were higher in the run off locations from ski areas than in mountain run off from areas seeing little to no disturbance from man. Once this data is confirmed, I can conclude that areas near Ski Mountains have higher levels of turbidity. This, in turn, means that these waterways have a higher temperature than areas with lower turbidity levels, and from this we can conclude that the dissolved oxygen levels are lower in areas near ski areas. Ultimately, this negatively impacts aquatic life, as lower levels of dissolved oxygen can be harmful to many aquatic organisms.

NAME(s) Max Robbins
PROJECT NUMBER B50
SCHOOL South Burlington High School
GRADE
TEACHER Curtis Belton

PROJECT TITLE **Food Preservation: Preserving Inside of the Fridge**

ABSTRACT

The purpose of this lab is to see if the preservation power of the fridge can be increased using common preservatives. The average consumer wastes over $400 dollars a year on spoiled meats and vegetables. Adding a preservative to already refrigerated food will preserve the food longer and salt will be a better preservative than vinegar. In my experiment, the control group is pork without any additional preservatives. The experimental groups are preserving the pork with salt and vinegar. The independent variable is the preservative added. This affects the number of bacterial colonies, the dependent variable. This lab requires a refrigerator to store the samples, agar plates to grow the bacteria, and an incubator to speed up the growth of the bacteria. A unique testing method I used was streaking on an agar plate and growing bacteria in an incubator. Preliminary data indicates that adding a preservative will decrease the amount of bacterial colonies on the pork. Preliminary data also indicates that salt is more effective than vinegar at preservation. I used comparative analysis to analyze my data. Food being preserved with an additional preservative while in the fridge can last longer and save money on food.

NAME(s) **Sara Roundy**

PROJECT NUMBER **C14**

SCHOOL Rutland High School

GRADE 11

TEACHER Debra Hathaway

PROJECT TITLE **Reactions of different metals used to make jewelry**

ABSTRACT

This experiment was chosen because when people wear ôfakeö jewelry, it can sometimes cause your fingers to turn green. The affect acids had on metals and jewelry were tested using mass. By performing this experiment, it was concluded that this reaction can occur because of the levels of Ph in your body. This reaction could also depend on where you live and what kinds of lotions and anti-bacterial soaps you are putting on your skin, while your ôfakeö ring is still on your finger.

NAME(s) **Sara Ruch**

PROJECT NUMBER **B51**

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **The Likelihood of Genetic Mutations of Drosophila Melanogaster Upon Exposure to Cigarette**

ABSTRACT

The purpose of this experiment was to determine whether or not cigarette residue affects the genetic processes of D. melanogaster over several generations. The plan was to have two wild type cultures; one exposed to a carpet piece that had been cured for a long period of time in a dome structure over several burning cigarettes, the other culture was the control and lacked a carpet piece. This setup was designed to simulate the normal exposure to cigarette residue one would face when living in a house with someone who regularly smokes indoors. After every cycle of a fruit flyÆs life the ratio of mutated fruit flies to normal was recorded. This ratio helped me determine whether or not there was a difference between the control culture and the experiment culture, while also making up for the differences in population between the two. Based on an article in Scientific American, 3rd hand smoke (cigarette residue) is projected to be just as dangerous as 2nd hand smoke. Based on these projections I hypothesize that a greater ratio of genetic deformities to normal wild type flies will occur in the experimental group. My preliminary evidence so far has not shown any conclusive trends, the occurrence of deformities is the same, but the severity is greater in the experimental group.

NAME(s) Gunther Schuler

PROJECT NUMBER C15

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **The Energy Densities of Various Biofuels**

ABSTRACT

The experiment is testing the energy contents of home biofuel solutions such as wood pellets and vegetable oil. Based of prior knowledge I hypothesized that of the biofuel solutions vegetable oil will have the best energy density. Biofuels are fuels sources who's energy is released through the combustion of biomass. The test will be carried out by igniting the fuels underneath an aluminum dish with water, the heat energy given off by the ignited fuel represents the potential energy to be gained. The set up contains a small glass dish underneath a aluminum bowl shape with a shield that extends around the fuel. Inside the bowl is a specific volume of water and The control variable is gasoline because it is the main fuel source that is being compared against. Preliminary data is still too little to be of use but I am hypothesizing that the vegetable oil will come in second. The data will be analyzed using water as a specific heat benchmark by the formula Q = cp m dT (where Q=kj of heat energy, cp is specific heat, m is mass, and dT is change in temperature.), this calculates the heat energy in the fuel. This project explores the energy densities of biofuel solutions.

NAME(s) Marlynn Serwili

PROJECT NUMBER C16

SCHOOL St. Francis Xavier School

GRADE 8

TEACHER Mary Ellen Varhue

PROJECT TITLE **Chemically Bright**

ABSTRACT

Photochemistry is an interesting subject that involves understanding how light affects chemical reactions. The purpose of my project was to find out which light affects the rate at which a chemical reaction occurs the most. I chose this project because I've been interested in chemical reactions for two years now and I thought this project could teach me things while being fun (I was right).

Hypothesis- My hypothesis is that fluorescent light will have the most affect on the rate occurrence of a chemical reaction because it's the brightest light source.

Procedure-First put on all safety materials (goggles, aprons, disposable gloves). Prepare areas with light sources (incandescent, fluorescent, sunlight and LED light). Create a standard in which the test samples will be compared to. Have five test tubes, wrapped in aluminum foil, ready. Create the iodine-ammonium-oxalate solution (2.5 grams of oxalic acid, 25 milliliters of , 25 milliliters of clear ammonium and 3 milliliters of iodine) and pour 4 milliliters of the solution in each test tube. Take the foil off of 4 of the test tubes (KEEP THE FOIL ON ONE TEST TUBE) and put the tubes in their light sources (label which light sources that the test tubes go into). In 15 minutes, 30 minutes, 1, 2 and 4 hours compare the test tubes to the standard and record the data and your observations. Do a follow up experiment in which temperature is the manipulated variable instead of light (cold, room temperature and hot/really warm) and record the results.

Results-Incandescent light's first, then fluorescent, sunlight and in last place LED light, but my secondary experiment showed that temperature had a huge impact on my experiment (incandescent light radiated a lot of heat) and therefore I'm unable to draw a conclusion.

NAME(s) Mehul Shah
PROJECT NUMBER P28
SCHOOL Frederick H. Tuttle Middle School
GRADE 7
TEACHER Greg Wolf

PROJECT TITLE **Wind Turbines: Number Of Blades and Energy Production**

ABSTRACT

Wind turbines always have three blades, do you wonder why. This test is designed to prove my hypothesis that three blades will generate the most amount of energy. Model scale wind turbine with different number of blades-2, 3, 4, and 6 was used to generate electricity (energy). The turbine was made using wood, corrugated plastic, plumbing parts and a generator. A small table fan was used as a wind source. The energy was measured in milliamps (mA) using a multi-meter. Observations: The six blade turbine generated the most amount of energy but was very wobbly creating a safety issue. The four blade turbine generated less energy than the three blade turbine, except at low fan speed where it generated more energy compared to the three blade turbine. The two blade turbine generated the least amount of energy and was also wobbly. In conclusion, even though the six blade turbine generated more energy, the three blade turbine is safer. Additionally, the difference in the energy generated by six blades and three blades is significantly low.

NAME(s) Beatrice Shlansky
PROJECT NUMBER G07
SCHOOL Mater Christi School
GRADE 6
TEACHER Mark Pendergrass

PROJECT TITLE **Is This A Stick-Up?**

ABSTRACT

The projectÆs purpose was to figure out which soil would be best for a stake in wet conditions. The idea came along after observing how stakes in a driveway became unstable after a heavy rain storm. It was hypothesized that clay soil would be the best soil for wet conditions. Research was conducted to learn about the different soil types and their stability with erosion and water. It was learned that soils with plants growing in them, along with denser soils had a greater probability of surviving wetter conditions.

The test was set up and a stake was placed in bins of soil. For every soil, cups of water would be poured onto the soil surrounding the stake, until the stake became unstable. The number of cups of water was recorded and the stake was moved on to the next test. Several soils were tested, including rocky soil, clay soil, potting soil, the control being soil with grass growing, and sandy soil. Originally there was also soil with grass growing, and the control being ôeveryday soilö but it was realized that the control and this were the same. The soil was removed from tests. It was observed that clay soil resisted water flow, unlike potting soil which was light and airy, causing the soil to use the least amount of water to destabilize. Soil with roots helped in surviving more cups, but not a lot. After analyzing the data, clay soil did perform best above all the other soils.

NAME(s) Nathalie Simo
PROJECT NUMBER C17
SCHOOL St. Francis Xavier School
GRADE 7
TEACHER Mary Ellen Varhue

PROJECT TITLE **Stain Be Gone**

ABSTRACT

Is it possible to use less than the recommended amount of detergent to clean clothes thoroughly? In my science project, I will find out if it is possible to use less and make my own recommendation based on my results. My hypothesis is that I think you can use less than the amount stated on the product.
I chose this project because I believe that the companies that make detergent probably exaggerate the amount of detergent needed so that consumers will want to buy more of their product.
Do you ever wonder why some stains never come out? In my research I found out that some stains are protein based and can be more difficult to remove than others. Most ingredients found in detergents include enzymes to help breakdown stains. Enzymes help breakdown molecule chains that make up protein stains. The enzymes in detergents separate certain stains from the laundry allowing the water and soap to continue cleaning.
The project procedures are as follows:
-Purchase 24 child size cotton white socks
-Select four types of stains that include: Spaghetti sauce, HersheyÆs chocolate syrup, mud, and brewed coffee.
-Create 6 sets of four stains. Place each set of 4 stains in the washing machine set to a regular cotton wash cycle.
-Use following percentages: 100, 75, 50, 25, 10, and 0 of the recommended amount for each of the different wash cycles.
-Compare the differences after each wash.
My results show that the 100% recommended amount matched the 75% amount. I believe my hypothesis is correct, and I think you can use less than the recommended amount. My recommendation is, no less than the 75% for best results.

NAME(s) Ava Simonds
PROJECT NUMBER P29
SCHOOL St. Francis Xavier School
GRADE 8
TEACHER Mary Ellen Varhue

PROJECT TITLE **Give Bricks a Chance**

ABSTRACT

With growing gas prices, locally made bricks are an environmentally wise product to consider for the permaculture movement; they can be made locally without any unnatural resources. Also, brick buildings have proved over time to be remarkably strong and long lasting. This projectÆs purpose was to find the best binder or reinforcement in a composite brick. The materials tested against the plain brick were fiberglass matting, chicken wire, cow manure, saw dust, straw, and asphalt. My hypothesis was that the fiberglass matting would be the strongest when added to the brick because of its esteem as a building material and its fibrous strength.
I built twenty-eight bricks, four in each category, and tested them in their tensile, for events such as earthquakes where the brick would be bent, and compressive strength, where the amount of weight on top of it pressing down is tested. For the tensile strength testing, I clamped one end of the brick to a table and pulled down the other end with two and sometimes three spring scales to measure the grams needed for each brick to break in half. For the compressive strength testing, I put the brick in between the two arms of the ôcö clamp and counted the full turns needed to create satisfactory breakage.
It became clear through the tensile strength testing that the individual organization of the categoriesÆ bricks definitely affected the results. The fiberglass, straw, and chicken wire bricks were constructed like a sandwich with the binder layer in between two parts of clay. With the other bricks, the binder was added into the mixture before it was poured into the mold. Because the bricks were organized in multiple ways, they broke differently and it would not be fair to draw a complete conclusion from this project.

NAME(s) **Brooke Slocum, Katie Sweet, Katya Brown**

PROJECT NUMBER **GP07**

SCHOOL Homeschool

GRADE 7

TEACHER Gina Sweet

PROJECT TITLE **Natural Fragrances by Us**

ABSTRACT

○The word perfume came from the Latin word perfume "through smoke". In the past, people used perfume to cover up the smell of dead bodies. Before big factories were built, women would make perfumes at home with things they had, and didn't have to spend money on factory made perfume.

○The purpose of our experiment was to see if we could make homemade perfume with fruit. We wanted to find this out because we are super girly girls and love all different kinds of perfume.

○Our hypothesis was that we could make perfume with fruit, and that it would smell better than non-fruited perfume, but also be sticky.

○ In our experiment we filled eight jars with different plants and fruits,and alcohol. We waited one week, then tested each one on our wrists. After thirty seconds we smelled them for strength and pleasantness. We also tested for stickiness by putting more perfume on our wrists and waiting another thirty seconds, then feeling it to see how sticky it was. The reason why we had to let the perfume dry for thirty seconds was because we needed to let the alcohol dry so we could actually smell the perfume and not alcohol.

We found out that you can make perfume with fruit but it can be VERY sticky! We found out that all fruit fragrances were somewhat sticky; you can make perfume with fruit as long as you like sticky perfume.

NAME(s) **Spencer Sochin, Josh Webster Heenan**

PROJECT NUMBER **GP09**

SCHOOL Folsom

GRADE 8

TEACHER Paul Fitzgerald

PROJECT TITLE **Solar Power Hour**

ABSTRACT

The sun is our main source of outside light, and when it is a clear day it is very bright out. So what if we took some of the sunÆs light energy and turned it into energy for homes and buildings? Well, that is what solar energy is. Solar Energy is becoming a big thing. It is a way to harness energy from the sun and turn it into energy for electric appliances. Instead of just letting the sun be our main light source, why donÆt we turn it into energy? ThatÆs what this project will be taking a look at.

We chose solar panels or the solar array as our science fair project. We chose the solar array because we have a solar array on our school; Folsom Educational Center in South Hero VT and we wanted to see if the array was saving us money. The solar panels on Folsom are sort of new, because in the past years, a group of kids worked on a solar array grant, and now Folsom has solar panels on the roof. The solar array takes up about a 20x20 foot area. The array is on top of our schoolÆs roof. The panels were installed in 2010 and our science fair project is partially going to be looking at the solar array at Folsom, and seeing if they have made an improvement or not.

NAME(s) Yuki Soga
PROJECT NUMBER S17
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Media and Memory**

ABSTRACT

○The purpose of this lab is to determine whether visual or auditory learning is more effective while trying to remember information. I believe that visual learning, or in this experiment, reading, will be the more effective method.
○My experiment consists of 100 participants, a third of which who will listen to a short story, another third who will read the same story, and the last third who will both listen and read to the story at the same time. All three groups well then be given the same questionnaire and be asked to answer questions about the story. In this experiment, the third group, who will both read and listen, are the control. The independent variable in this experiment is the method of relaying the information to the participants, whether it be through reading or listening. The dependent variable is how well they do on the following questionnaire.
○My data will consist of 100 test ôscores,ö which I will group by category. Excluding the control group, the category that has the highest average test score will be the group that has retained the most information from the story, and therefore the most effective method or relaying information to memory.
○Of my twenty or so participants so far, the average ôscoreö has been around an 80%, although I have only tested for visual participants at this point in my experiment. I believe this to be a relatively high score compared to what the results for auditory participants.
○I believe that the visual-learner participants will have remembered the most information.

NAME(s) Talia Solomon
PROJECT NUMBER B52
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **The Effects of CO2 On Fruit Preservation**

ABSTRACT

The purpose of this project is to test the effectiveness of using carbon dioxide produced from yeast as a method of fruit preservation. Background includes a study done by the Volcani Center, in Israel, in which CO2 is found to be effective in preserving fruits. The hypothesis is that fruit in an environment with higher levels of CO2 will stay fresh longer then fruit in an environment with naturally occurring levels of CO2 found in room air. The experiment will consist of placing one apple, one banana, and one orange in three separate holding boxes and feeding into each of these boxes CO2 produced from fermenting yeast. The fermenting yeast will be held in three separate bottles, with tubes connecting the bottles to the boxes. CO2 levels will be tested daily using bromothymol blue. The control for this experiment is three fruits of the same verity, which will be in other containers and not exposed to augmented levels of CO2. The independent variable is the level of CO2 the fruit is exposed to. The dependent variable is how much the fruit decays over the course of several days. Amount of decay will be determined by measuring the loss of mass in each fruit due to leaching. No data has currently been collected thus far in the experiment. Both quantitative and qualitative data will be collected. No conclusion has been reached thus far.

NAME(s) Will Solow
PROJECT NUMBER S18
SCHOOL Hinesburg Community School
GRADE 7
TEACHER Mrs. Konowitz
PROJECT TITLE **Subconscious Sublimation**

ABSTRACT

When I conducted my experiment on subliminal advertising I wanted to know if a subliminal message would sway a personÆs choice on that product. Basically I wanted to know if a subliminal message could change their choice on a product. I was interested in this because companies spend a lot of money putting subliminal messages and images into their commercials so I wanted to see if subliminal messaging actually works. A subliminal message is the perception of the stimuli too weak to be noticed consciously but still strong enough to have an effect on our behavior and thoughts. To conduct my experiment I took thirty people and showed half a video with the subliminal message and the other half the same message without the message. It turned out that only about thirteen percent of the experimental group was affected by the message when about 60 to 80 percent of them should have been affected.

NAME(s) Zack Stevens
PROJECT NUMBER C18
SCHOOL Rutland High School
GRADE 11
TEACHER Jody Sabataso
PROJECT TITLE **Compounds of Sports Drinks**

ABSTRACT

Abstract
○People consider sports drinks to be a vital part of their workout. Do people really realize what they are drinking, or do they just see it on the commercials advertised by professional athletes telling the average human to buy because it is the ôbestö? I wanted to reveal exactly how many sugars (carbs), potassium, and sodium the drinks contained to show consumers what is better for them. The hypothesis that I explored was the more expensive the sports drink the fewer the additives. To carry out my experiment I dissolved the liquids out of the sports drinks, I than separated the compounds and weighed them. Out of the four sports drinks that I tested, Powerade came out with the least amount of sugars (35g), sodium (250mg) and potassium (63 mg). Gatorade had just little more than Powerade, but the cheaper brands that I tested like Price Chopper and Hannaford brands had way more sugars and less potassium and sodium. I reached the goal I was trying to obtain with finding which sports drink had the least amount of additives.

NAME(s) **Issac Surridge** PROJECT NUMBER **P30**

SCHOOL Millers Run School GRADE 8

TEACHER Phillip Heinz

PROJECT TITLE **Fun with Insulation**

ABSTRACT

NAME(s) **Luke Sweet** PROJECT NUMBER **P31**

SCHOOL Homeschool GRADE 9

TEACHER

PROJECT TITLE **Refract Cool**

ABSTRACT

Will a light refract more when the temperature of water gets colder and less when the temperature gets warmer? My hypothesis was that as the temperature of water increases the laser will refract less, as the temperature of the water decreases the laser would refract more until it reaches 3.0 degrees Celsius. At this point it will begin to refract less. The more dense a substance is, the more a light refracts. When water gets colder, the density becomes greater, so the laser should refract more. When water reaches 3.0 degrees Celsius, the density decreases so I thought the laser would refract less.

○To test my hypothesis, I built a glass tank and filled it with distilled water. I made a wooden support to hold my laser at the correct angle. I attached a protractor on the water line of the tank. I attached an outdoor thermometer that measures to the tenth of a degree. To warm the water, I took eight ounces out of the tank and warmed it in the microwave for 120 seconds. Then, I poured it back into the tank and stirred the water. To cool the water, I froze 8 ounces of distilled water in cups. I took 8 ounces of water out of the tank and stirred in 8 ounces of ice. When the water stopped moving I measured the temperature and the angle of refraction.

○My experiment partially supported my hypothesis. The laser light refracted the way I expected as the temperature increased and decreased, however, it did not start to refract less at 3.0 degrees but rather at 6.2 degrees Celsius.

My accuracy of measuring the refraction was not that great because I unintentionally looked at the laser from different angles, and the laser light width was too wide to get an exact angle

NAME(s) Nicholas Sweet
PROJECT NUMBER P32
SCHOOL Rutland High School
GRADE 10
TEACHER Susan N Ponto

PROJECT TITLE **Rate of oxidation in different metals**

ABSTRACT

Abstract-
For my science fair, I tested the oxidation rates of different metals. I hypothesized that iron would rust the fastest. Copper and then Aluminum follow this. I came up with this hypothesis because I see a lot of rusted iron, but not much copper or aluminum. To conduct this experiment, one must take sandpaper and remove the factory finish to expose the true metal. Then I took the metal and inserted them into a wooden holder and wrapped the tops in electrical tape to close the tops. Then leave them outside for about 1 month, recording the weather and taking pictures to track the rate of rust forming. After 1 month I took the experiment inside and calculated the percent of rust that covers the metal. Iron was covered by rust on 60% of its surface, copper was about 80% discolored, but not much patina, and aluminum only had 5% coverage. All in all, I conclude that iron rusts the fastest. While copper was almost totally discolored, itÆs only because more of its finish came off than irons. Lastly, the aluminum was only covered by a few specks of rust (5%). My hypotheses were proven correct in the sequence in which the metals rusted. While this is already rather well known as a scientific fact, what it does is it shows how important it is to make sure all metal surfaces, be it for construction or art is covered in a rust resistant finish. This is especially the case here in colder climates.

NAME(s) Stephen Terry
PROJECT NUMBER G08
SCHOOL Avalon Triumvirate Academy
GRADE 12
TEACHER Amanda Gifford

PROJECT TITLE **Eclipses**

ABSTRACT

The Chinese believed during a solar eclipse that the sun was being eaten by a dragon. The Chinese then made noise to scare the dragon away. Astronomers believed in the next six hundred years the earth will be too close for any eclipse to happen.
It is believe that during Lunar eclipses the shadows from the moon on the Earth cause more darkness seen from Earth than during Solar Eclipses when the shadows from the Earth on the Moon. This is because of a New Moon and a Full Moon. There are three types of Solar and Lunar Eclipses. The three Solar Eclipses are Partial, Annular, and Total. The three Lunar Eclipses are Penumbral, Partial, and Total.
A model of the rotation of the moon and the sun was created to show if a solar or lunar eclipses was darker in areas than the other. The results were that a solar eclipse has darker areas than a lunar eclipse.
After testing for how much darkness in the area where the shadow was projected, information showed that a Solar Eclipse is darker in some areas than Lunar eclipses. This happens because the sun is at its high point in the sky.
Solar and Lunar Eclipses are useful to the world because it gives astronomers wonder what is out in space. Eclipses are rare to see. Without it would change religious and tribal beliefs.
In conclusion eclipses can be fascinating to see and only happens once in a lifetime. The Planets are some mystery that gives us about wonder in the universe. An eclipse is a phenomenon created by nature and gives us a time to think about this.

NAME(s) **Moritz Thali**

PROJECT NUMBER **B53**

SCHOOL South Burlington High School

GRADE 9

TEACHER Curt R. Belton

PROJECT TITLE **The effect of the freezing point on grass growth**

ABSTRACT

The purpose of this lab is to test if plants respond specifically to the freezing point of zero degrees Celsius when beginning growth in the spring. The hypothesis is that the grass that is constantly above freezing will show growth, while the plants that experience below freezing temperatures will not show any measurable growth. This will be done by having a control group that is constantly in temperatures well above zero, a second experimental group that will fluctuate between temperatures slightly above zero and ones well above zero (to simulate the temperature patterns in a regular day), a third group that will fluctuate between temperatures slightly below zero and temperatures well above zero, and finally a group that will fluctuate between the temperatures that are outside, and temperatures well above zero.

○During a growth period of about one month, the grass will be measured daily and checked for new sprouts and other signs of growth. The data will be shown by total growth over the growth period, percentage of growth relative to the original height of the grass, and by observations of new growths appearing from under the soil. Four plots of grass have been excavated from the same location, and placed into separate trays.

NAME(s) **Olivia Towne**

PROJECT NUMBER **B54**

SCHOOL Rutland High School

GRADE 11

TEACHER Ann Marie Mahar

PROJECT TITLE **Is It Really Clean?**

ABSTRACT

People always think that if they clean, then nothing is dirty. However, it is very hard to clean what cannot be seen. I chose to do my project on bacteria to prove that it is everywhere, even in cleaned places. I chose to collect bacteria samples in six local places in Rutland, which were, Rutland High School, Rutland Free Library, Rutland Hospital, ApplebeeÆs, The Diamond Run Mall, and the Flagship Cinemas. My hypothesis was that although bacteria is everywhere, the hospital will contain the most bacteria based on the amount of people that go there with sicknesses. I hypothesized the order of the remaining places after the hospital with the most bacteria would be Rutland high School, ApplebeeÆs restaurant, Rutland Free Library, Flagship Cinemas, and lastly, the Diamond Run Mall because of the amount of people that go to each place.

To start, I made the agar needed to collect three samples from each location. I then went to each location and used sterilized Q-tips to collect the bacteria off of the railings inside of the buildings. I chose it to collect from the railing because people are always touching them but they may not always get cleaned. I then put my sample in the incubator for five days so the bacteria could grow. My results proved my hypothesis correct in the fact that the hospital did contain the most bacteria. The hospital average for the amount of bacterial colonies was twelve. However, my prediction of the order of the remaining locations with the most bacteria was off. Flagship cinemas had an average of seven colonies, Rutland Free Library had an average of six, Rutland High had and average of five, the mall had an average of four, and ApplebeeÆs had an average of three. Overall my project was still successful because it proved that bacteria is everywhere

NAME(s) **Winthrop Townsend**

PROJECT NUMBER **P33**

SCHOOL Windsor High School

GRADE 12

TEACHER Jennifer Townsend

PROJECT TITLE **Airfoil Surface Textures**

ABSTRACT

The purpose of this experiment was to test the effects of surface textures of airplane wings on their efficiencies. In the past it was a common understanding that smooth textures are the most efficient in all aspects of aerodynamics. Throughout the evolution of the airplane wings, many engineers have played around with the shape and size of an airplane wing and not their textures. Looking at a golf ball I hypothesized that texturing a wing in the form of dimpling might have a positive impact on the efficiency of the wing. To test my hypothesis I created three different airfoils. One was covered in sawdust to simulate ice, another was smooth, and the third was dimpled to simulate the golf ball effect. I then created a contraption that I could mount on my car and it would measure the lift and drag of the airfoil. I proceeded to drive down the road at different speeds and angles of attack, collecting my data while doing so. Over a variety of angles and speeds, the lift over drag ratio of the dimpled wing was consistently better and outperformed the rough and smooth wings in all aspects of the test. Due to this my hypothesis was supported; dimpling a wing will cause it to be more efficient.

NAME(s) **Viann Tran**

PROJECT NUMBER **B55**

SCHOOL St. Francis Xavier School

GRADE 8

TEACHER Mary Ellen Varhue

PROJECT TITLE **Feathers**

ABSTRACT

My project involved testing the types of soap and detergent on oil on feathers. The purpose of this was to support taking care of our environment. Oil spills, a negative issue to our earth, happen every day. Whether it is small or large, the environment is negatively affected by spills. Oil spills affect birds because they attach to their feathers, which are vital to the birdÆs survival. Feathers provide insulation as temperatures change. The oil can cause misalignment with the feathers causing hypothermia or hyperthermia. Additionally, birds preen, as in cleaning their feathers with beaks, and swallow the oil causing internal damage. My hypothesis was that the laundry detergent would rid of the oil the most.

>To start, you will need feathers (trimmed to the same size or weight), motor oil (if troublesome, fear not for you can use corn oil), room temperature water, liquid laundry soap, liquid hand soap (in my case I use bar shavings from a hand soap bar), liquid dish-washing soap, body wash, and 5 cups for one trial. I had weighed the plastic cup and feather separately. I labeled each cup for each type of soap or detergent. I placed a feather dipped in oil into the cup along with water and the appropriate detergent or soap in it. I soaked the feathers for an hour but every ten minutes swished it for ten seconds. After that, I slightly dried the feather of water and weighed the feather.

>My results disproved my hypothesis and the dish-washing soap was more favorable. Through this, I hope to have people see one method of helping the birds.

NAME(s) **Alex Trudeau** PROJECT NUMBER **P34**

SCHOOL GRADE **8**

TEACHER Mary Ellen Varhue

PROJECT TITLE **Burn Baby Burn**

ABSTRACT

If you have a wood stove, wouldnÆt it be helpful to know what wood will heat your home the best? My project asked, ôWhich wood type has the best caloric value?ö I tested three wood types: Ash, Honey Locust, and White Pine. I thought that ash would do the best out of the three wood types. To conduct my experiment, I built a calorimeter out of two coffee cans and some metal rod. Then, I prepared 20 grams of each wood type for ten testÆs worth.

To test the energy value, I would measure the temperature of the water in the upper can of the calorimeter before and after the wood burned inside the larger coffee can, subtracting the larger temperature by the smaller. The first time I ran through my experiment, Honey Locust did the best (79.95 deg F), followed by Ash (72.31 deg F), and finally followed by White Pine (69.01 deg F). That day it was only about 20 degrees outside. There was a lot of heat loss from the cold weather. My results seemed invalid, so I re-conducted my experiment. My second time, I added some insulation to my calorimeter to see if heat loss really did play a role on my results. It did, and that showed in my averages. White Pine did the best in my second run (89.38 deg F), and then Ash (87.52 deg F), and then Honey Locust (73.28 deg F). White Pine and Ash both boosted up by at least 15 deg F, but Honey Locust did not change for the better like the others. Its average temperature went down by about 7 deg F. On that day, it was just over freezing for all the tests I conducted.

NAME(s) **Amanda Tucker** PROJECT NUMBER **C19**

SCHOOL Fair Haven Union High School GRADE **11**

TEACHER Shawn Ketcham

PROJECT TITLE **Non- renewable vs.Renewable Oil for the Future**

ABSTRACT

The experiment was to test first if renewable energy sources (vegetable oil) and non-renewable oils (fossil fuel) had the same amount of energy. Then secondly I tested a variety of renewable energy sources and compared them for energy output. I suspect that renewable fuel (sources that are naturally replenished) will have the equivalent amount of energy as non-renewable fuel (fossil fuels) because renewable fuel is also considered as a biofuel and has been burned for energy as well. The experiment was the measuring of the energy released by the different oils, renewable and non-renewable (fossil fuels.) This was made with putting cotton cordage on a paper clip, and then squeezing oil on the cordage with a soda can two inches above containing water. The water had an initial temperature reading, then the cotton cordage was ignited and the stop watch was started. Once the cotton cordage went out the stop watch was lapped and the temperature was recorded. It also was noted when the temperature rose even after the cotton cordage went out and the time was recorded as well. This was repeated three times for each oil test. After testing all the oils, it showed that the canola oil produced the highest amount of energy and had more energy than the thirty weight motor oil (the non- renewable oil.) I measured the energy by comparing the output of energy in joules. It was found that renewable and non-renewable oils can produce the same amount of energy if not more.

NAME(s) **Matthew Tufts**

PROJECT NUMBER **M05**

SCHOOL Windsor High School

GRADE 12

TEACHER Jennifer Townsend

PROJECT TITLE **Percentage of Runs Prevented: An Alternative Baseball Statistic**

ABSTRACT

Earned Run Average (ERA) is the most common method for evaluating pitchers. Yet, rather than factor in the offensive potential of the opponent, ERA relies solely on the amount of runs allowed by the pitcher. As a result of this, ERA is skewed by the offensive strength within the pitcherÆs division. Using the average number of runs each MLB team will score per inning, I developed a new statistic that is not affected by the offensive prolificacy of the opposing team. Percentage of Runs Prevented (PRP) is a ratio of the number of earned runs allowed by a pitcher in a specific outing, compared to the average number of runs a team will score in an outing of equal length against a neutral pitcher. To compare ERA and PRP, I took the top 20 pitchers as ranked by ERA, and calculated their respective PRP. I reordered the rankings with respect to PRP and analyzed the results by division. The results showed a distinct upwards tendency in the PRP rankings of pitchers in the A.L. East. In the highest scoring division, A.L. East pitchers face opponents that inflate their ERA. However, when ranked by the unbiased PRP, these players rose from the bottom half of the top twenty, to the top ten. Working similarly, but to the opposite effect, pitchers with low ERAs in the N.L. West (baseballÆs lowest-scoring division) ranked lower in PRP because they gave up a similar number of runs, but in a weaker division. The current standard of ERA is faulty because strength of division can inflate or decrease it. PRP is an unbiased statistic that incorporates the strength of the opponent and weights the runs accordingly.

NAME(s) **Brendon Utley**

PROJECT NUMBER **P35**

SCHOOL Millers Run School

GRADE 7

TEACHER Phillip Heinz

PROJECT TITLE **Isul-mania**

ABSTRACT

NAME(s) Morgan Vaudrien
PROJECT NUMBER C20
SCHOOL Northfield Middle High School
GRADE 11
TEACHER Cynthia Tomczky

PROJECT TITLE **The Effect of Salinity on the Solar Heating of Water**

ABSTRACT

In this lab, the affect of the salinity of water was tested on the change in temperature when solar heated. It was hypothesized that the salinity of the water would cause the average percent change in temperature after solar heating to decrease. This was performed by using a homemade passive solar collector, with a tube running through a black box in loops, with a tube to collect water from room temperature water at one end, and a tube to release heated water that has cycled through the collector. To ensure the same amount of radiant energy was being distributed throughout the collector, without having the sun exposure compromising the results, a heat lamp was used at the same distance and angle from the collector for each set of results. After allowing 1800 milliliters of water with salt additions of 0 grams, 20 grams, 40 grams, and 60 grams to cycle through the collector once, I then recorded that temperature of the cycled water compared to the room temperature water and found the average percent change of each variable. The third data series seemed most accurate, with a tinfoil backdrop and a black tube, where as the control with no salt added had a 32.97 percent change in temperature, while the test with 20 grams added had a 23 percent change, 40 grams had a 16.71 percent change, and 60 grams had a 10.01 percent change. This supports that with the increase in salinity, the percent change in temperature after cycling through the collector will be lesser, because salt increases the density of water, and lowers itÆs specific heat, giving it a higher boiling point.

NAME(s) Danielle Walters
PROJECT NUMBER B56
SCHOOL Rutland High School
GRADE 11
TEACHER Dawn Adams

PROJECT TITLE **What Does Your Cleanser Do?**

ABSTRACT

Will Noxzema, Neutrogena, Suave or water kill the most bacteria, therefore getting rid of the most acne?

The predicted hypothesis was that Noxzema would kill the most bacteria on a skin cell.

The approach for investigating this problem was to wash a section of skin with the Noxzema cleanser, then take a skin cell sample using a Q-tip, and finally rub the Q-tip on the Petri dish containing the agar. This procedure would then be repeated using the other cleaners. Water was used as the control and Noxzema, Neutrogena, and Suave were the variables.

The answer obtained was that Noxzema did indeed kill the most bacteria compared to the other cleansers. Noxzema had an average of 4% of the Petri dish covered with bacteria, followed by Neutrogena with an average of 15%. Suave had an average of 63%, and lastly water had an average of 80%. The results concluded that Noxzema was the best cleanser for getting rid of acne due to the amount of Salicylic acid in it.

This science fair project provided a basic method of getting rid of acne, which is every high school studentsÆ nightmare. It also gives the reader an understanding as to why Noxzema kills such a high amount of bacteria.

NAME(s) **Pearl Weggler**

PROJECT NUMBER **B57**

SCHOOL Northfield Middle High School

GRADE 11

TEACHER CynthiaTomczyk

PROJECT TITLE **The Effect of Inulin on the pH Change in Fermenting Whole Milk and Lactaid Milk**

ABSTRACT

If different amounts of inulin (0g, 2.5.0g, 5.0g, and 7.5g) are added to 200ml of fermenting whole milk and 200ml of fermenting whole milk Lactaid, then how will the inulin effect the change in the pH of the milk compared to milk without inulin? When using regular whole milk the trend showed that the change in pH increased as the inulin increased. When 0g, 2.5g, 5.0g, and 7.5g of inulin were tested using regular milk the overall pH changes were 0.27, 0.58, 0.60, and 0.74 consecutively. The regular milk tests started at an average pH of 6.82 on the first day. The 0g test dropped to a pH of 6.56, the 2.5g test to 6.24, the 5.0g test to 6.22, and the 7.5g test to 6.07 on the fifth day. When 0g, 2.5g, 5.0g, and 7.5g of inulin were tested in the Lactaid whole milk, the pH changes were 1.00, 1.01, 1.17, and 1.01 consecutively. The Lactaid tests with 0g and 7.5g grams of inulin had approximately the same overall pH change in the Lactaid tests: 1.00 and 1.01. The Lactaid milk tests started at an average pH of 6.83. The 0g test dropped to a pH of 5.85, the 2.5g test to 5.82, the 5.0g test to 5.68, and the 7.5g test to 5.81 on the fifth day. The Lactaid data did not correlate a trend with the amount of inulin present. In the Lactaid tests the ending pH value of each different variable averaged together was 5.79 on the fifth day, while in the regular whole milk tests it was 6.27. The pH recorded from the Lactaid trials on the fifth day were very close in value regardless of the amount of inulin present, unlike the regular whole milk trials where the pH values decreased as the inulin increased.

NAME(s) **Daniel Wierzbicki**

PROJECT NUMBER **P36**

SCHOOL Windsor High School

GRADE 12

TEACHER Jennifer Townsend

PROJECT TITLE **How Colors of the Light Spectrum Affect Temperature**

ABSTRACT

The purpose of this experiment was to determine whether the different colors of a light spectrum have different temperatures. The hypothesis was, if the colors in a light spectrum conduct heat than the violet color will have the highest temperature because it has the shortest, fastest wavelength. First the prism was attached, with duck tape, on the edge of the cardboard box on the side facing the sun. Then a white sheet of paper was placed in the box so that the light spectrum hit near the center of the paper. Next, saran wrap was placed on three thermometers so that the bulbs were uncovered. Then the bulbs were spray painted black. Two thermometers were then placed into the box, not touching the light spectrum, to find the air temperature. Once found, one bulb was placed into the red light of the spectrum and one was placed into the blue/violet light. In two-minute increments, up to ten minutes, the temperatures were. This process was then repeated three more times. Then the third thermometer was placed into the yellow part of the spectrum and the steps were repeated. There were four trials for each color, two inside and two outside, and the results came out identically linear. On the inside trials, red light rose to an average of 4.2 degrees Celsius more than the blue/violet light, and 3.36 degrees more than the yellow light. Outside, the red light rose to an average of 3.33 degrees more than the blue/violet light, and 1.7 degrees more than the yellow light. In conclusion, the blue light refracted the most while the red light was very thin. The blue light might have lost energy because of spreading out while the red kept all of its energy in a tight area.

NAME(s) Josh Wight
PROJECT NUMBER M06
SCHOOL Rutland High School
GRADE 11
TEACHER Dawn Adams

PROJECT TITLE **AutomatiCraft**

ABSTRACT

In the PC game Minecraft, activities such as collecting resources, clearing out areas, and building large structures can be time-consuming. For this project, I wrote a mod for the game intended to automate such processes in the game and make them faster. Using the original source code as a guide, I wrote code for eight new game blocks that moved, placed, collected, stored, and crafted materials. I then tested my work with four different challenges of my own design: constructing a long railroad bridge, crafting and placing piston blocks, digging a large hole, and collecting large quantities of dirt blocks. I played each challenge several times both with the modÆs enhancements and without them. The mod allowed me to complete the first and third challenges faster, on average, than I could without it, but it only hindered my performance on the other two. On average, it did not significantly improve my completion times. This demonstrated that the mod is only useful in some scenarios, and also that I was capable of writing a fairly functional mod.

NAME(s) Chatham Wilkings
PROJECT NUMBER B58
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Can Oyster Mushrooms Reduce Hydrocarbons in Urban Run-Off?**

ABSTRACT

The purpose of this experiment is to see whether Oyster Mushrooms could be used to reduce the amount of hydrocarbons in storm water retention ponds. The first step was to order a Oyster Mushroom patch from an online source that specializes in mushrooms. I then put it in a tub that is tilted creating a water pool at the bottom. A pump is used to circulate the water and oil to the top of the tub creating a trickle method. The mushrooms were then introduced to the tub containing 11 cups of water and allowed to grow for 5 days. A control was created using all the same components but no mushrooms. Twice a day the mushrooms get sprayed and additional cups of water are added to both tubs to keep the water height constant. Oil is then introduced to both tubs creating a mixture of 10.5 cups water and 0.5 cups hydrocarbons. After one week, the oil and water mixture will be frozen so that the water is solid and the oil can be measured. The equipment will be cleaned and then a fresh 10.5 cups of water and the remaining oil will go back in. Measurements of the oil quantity will be taken weekly for several weeks. The data collection has not been completed and therefore no conclusions can be drawn yet.

NAME(s) Camden Willsey
PROJECT NUMBER C21
SCHOOL Hinesburg Community School
GRADE 7
TEACHER Stephanie Konowitz
PROJECT TITLE **Pyro Pellets**

ABSTRACT

Many people are starting to heat their homes with wood pellets instead of traditional fire wood. Different wood pellet manufacturers make their pellets differently which affects the heat output. This experiment was conducted to find the pellet brand that would burn at the highest temperature. The results would help with the purchasing of the pellets since most people buy a few tons of the same pellets for each winter. One full bag of pellets was put in the pellet stove and the stove was turned on at power level four. I measured the temperature after the fire had been burning for thirty minutes and continued checking at ten minute intervals. After the pellets ran out I added the next pellet brand. Although the room temperature when the fire started burning was quite consistent each pellet brand burned at a different temperature. From my results I have found that Cubex pellets are the highest quality pellets and the best to heat my home for the cold Vermont winters.

NAME(s) Owen Wood
PROJECT NUMBER P37
SCHOOL St. Francis Xavier School
GRADE 8
TEACHER Mary Ellen Varhue
PROJECT TITLE **Expansion**

ABSTRACT

This project tested, which wood types expand most under water. My hypothesis was that the least dense wood would expand more because there is more space to expand. The wood that is the densest will expand the least because there is not a lot of room to expand.

I chose this project because there is that door that just does not open or is very hard to open in different seasons. Therefore, I wonder which wood would be best to use so the wood will not get stuck. That is why I chose this project.

The first step is to measure the wood and get the moisture level. From this you will know how much it expanded. Then you want to put the wood in water and take the wood out to measure its dimensions and moisture level every two days. The temperature should stay the same throughout the experiment.

In this experiment, I found that my hypothesis was right: the least dense wood expanded more because there is more space to expand. The wood that is the densest will expand the least because there is not a lot of room to expand. I also found out that the wood expanded more on the ends of the wood than in the middle of the wood this is because the water can come through the sides. So if you want a door that does not get stuck then you want a door that is really dense to start out.

NAME(s) Courtney Wright
PROJECT NUMBER G09
SCHOOL South Burlington High School
GRADE 10
TEACHER Curt Belton

PROJECT TITLE **Biodegradability of Packaging Materials**

ABSTRACT

To determine what packaging material is least harmful to the environment, it is necessary to determine the rate at which materials biodegrade. The Pacific Garbage Patch has grown larger every year with pollution. The majority of this garbage is plastics, making it likely that a natural alternative such as paper and plant based materials will biodegrade more quickly. To test this hypothesis, the BOD (biological O2 demand) method was used. The BOD method was altered to suit this experiment so that different types of commonly used bags were placed in BOD bottles to incubate over periods between 1-6 weeks. In each set of BODs (incubating for 1-6 weeks each) 2 blanks were added that had only collected water from marine environments. This accounted for the control group, while the BOD bottles with materials were the experimental group. The same materials were also placed in tea balls in aerating collected water so that O2 would not limit biodegradation and left there for 8 weeks. By the end of six weeks, O2 in the blanks had fully depleted, making O2 the limiting factor in the experiment. Quantitative and observational data analyses were used to examine the results of this experiment and determine what they mean. The null hypothesis was proven to be correct, paper was most biodegradable, but it had some side effects. Keeping with the trend seen in BODs, the tea balls are expected to have shown more biodegradation backing up the null hypothesis.

NAME(s) Dakota Wright
PROJECT NUMBER P38
SCHOOL Rutland Highschool
GRADE 11
TEACHER Dawn Adams

PROJECT TITLE **Helicopter Speed Trials**

ABSTRACT

○My science fair tested the effects on the amount of blades on a helicopter to the amount of lift produced.The theory of lift works the same on helicopter blades as it does on the wing of an airplane. The purpose of my experiment was to try and find the perfect amount of blades that creates the most amount of lift. There is a medium because the more blades you add the heavier it gets and less blades takes away lift. The problem I investigated was to see how many blades could be taken off until the helicopter could not be lifted off the ground. To test this I attached a remote control helicopter to a vertical wire with a 1 meter mark on it. I started with four blades on the helicopter and then one by one I brought it down to one blade where the helicopter could not even get off the ground. I found out that with the four blades on the helicopter there was the fastest lift it was an average of one second. Then as each went down the time got a lot slower. This shows that the more blades there are the more power is produced. Unless there are so many blades that the weight keeps the blades from doing their job. My hypothesis was accepted and I met my objectives. I wish I had the option to add blades as well because it would be the other side of the problem. In all I think that this experiment was fun but may have not been the most productive idea.

NAME(s) Dominic Wysolmerski
PROJECT NUMBER P39
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **Does String Really Matter?**

ABSTRACT

Being an avid tennis player, and always seeking a competitive edge, I was curious to find out if using a particular type of tennis string would help me to increase the speed of my serve. There are many different types of tennis string on the market, each with their own specific properties, all claiming through powerful and expensive advertising, that they are the best. I tested five different types of string, all from the industryÆs most notable brands and was able to determine which ones improved the speed of the serve.

In order to test this I used three identical tennis rackets, each strung with the five different types of string. I invited two experienced tennis playing friends to help with the testing. In order to measure the speed of each serve, I purchased a state-of-the-art, hand held radar gun. Each of us hit 10 or 25 serves with the four test strings and the average speed of each serve was recorded and compared to the average speed of the 10 serves hit with the control string. When all data was recorded, compiled, graphed and analyzed it was obvious that the stiff polyester string allowed the user to hit the fastest serves. Serves were hit with the polyester string at an average speed of 3-10 miles per hour faster, than serves hit with the slowest string, natural gut. Utilizing the polyester string resulted in serves measuring over 100 miles per hour.

After analyzing the results of the experiments, I was able to conclude that the more expensive string (natural gut) was actually the string that produced the slowest serves. Interestingly enough, three players of different height and weight had consistent results. Also, I was able to prove my hypothesis, that if a different stringing material is used it will have an effect of the speed of the serve.

NAME(s) Savannah Zigic
PROJECT NUMBER B59
SCHOOL Hinesburg Community School
GRADE 7
TEACHER Stephanie Konowitz

PROJECT TITLE **The Spice Test**

ABSTRACT

The goal of my experiment was to discover the types of food one can taste after eating something spicy. My interest in this project arose from my love of cooking and my ambition to become familiar with the strength of different tastes and how to balance them. During my research, I discovered that the spiciness of a pepper is measured in special units called scovilles and that one of the spiciest peppers in the world is the Bhut Jolokia (Ghost Pepper) which measures 1,000,000 scoville heat units. To conduct this investigation the subjects were blindfolded and instructed to eat a spicy mixture. Then they were asked to try four more mixtures, each one representing the four tastes: salty, sour, bitter, sweet. At the end of the procedure, the subjects tried to identify the mixture they tasted afterwards as well as the one that had the strongest taste. At the end of the experiment I concluded that saltiness and sourness were the tastes detected by most subjects. Sweetness was the least detected taste.

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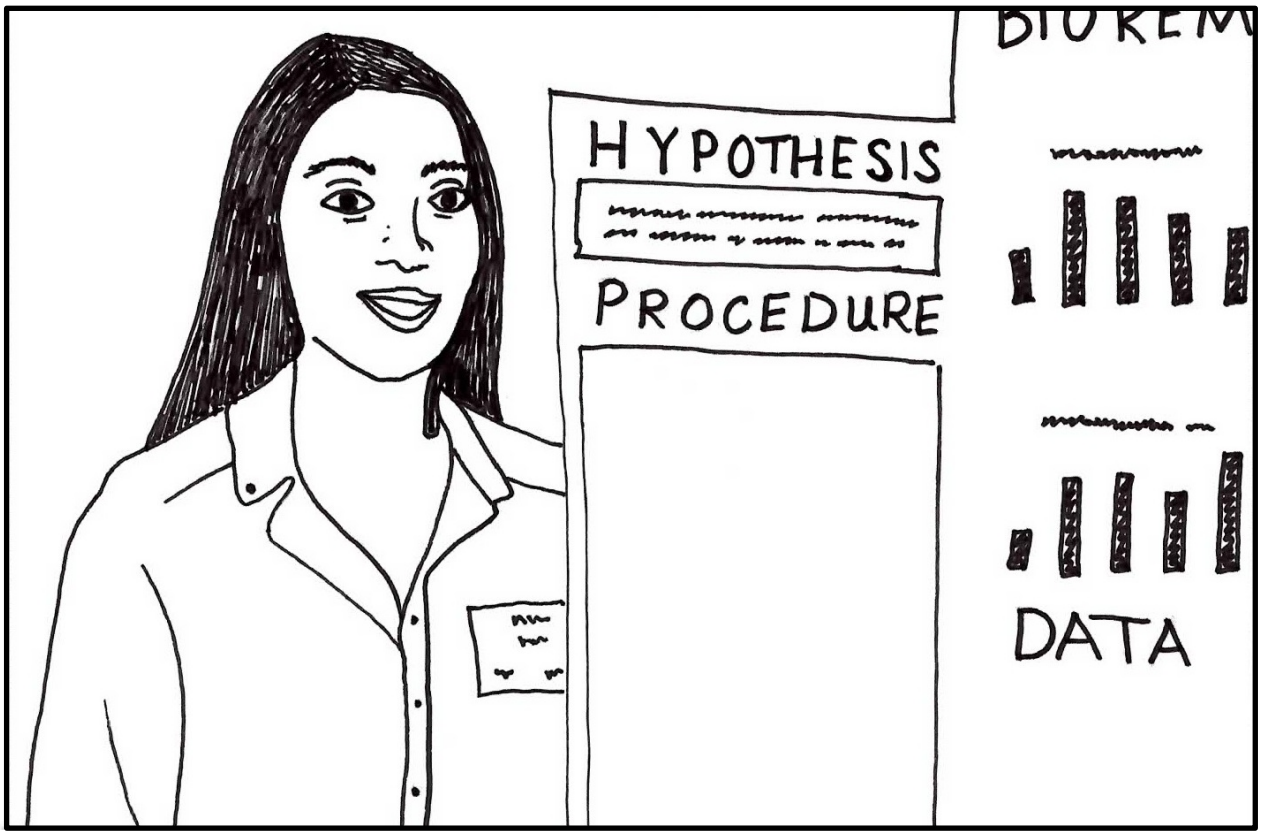
2012 Awards Ceremony Speaker

Riya Patel

presents

"Science Without Limits"



Riya's 2011 International Awards

International Sustainable World Energy, Engineering, & Environment Project Olympiad (I-SWEEEP) 2011, Houston, Texas, May 4-9, 2011 -Bronze Medal -$400, "Special Award:" Prairie View A&M University -"Physics of The Future" book by Michio Kaku, -Blind Spot documentary,

Intel International Science and Engineering Fair (ISEF), Los Angeles, California, May 8-14,2011 "Special Award:" MAWHIBA-King's Foundation for Creativity and Giftedness in Science Education (Kingdom of Saudi Arabia) -3rd place for the Award for "Innovations in Potable Water Technology" -Medal -$2,000 cash

Awards Program, March 31st , 2012

VSSMF Awards

VSSMF Silver Medalists

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Announcement about Green Mountain College & Norwich University's NG Scholarship winners

Norwich University - top five juniors

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Nathaniel Group

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Northeast Section Institute of Food Technologists

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Society of Manufacturing Engineers, Green Mountain Chapter

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VSSMF Local Awards, Cont'd.

Vermont Energy Education Program

Vermont Chapter, Sigma Xi

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National Awards

Grades 5-8

Broadcom Masters

Grades 9-12

I-SWEEEP

Genius Olympiad

ISEF Affiliation Awards

Grades 5-8

U.S. Marines

Grades 9-12

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American Meteorological Society

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Intel Excellence in Computer Science

Mu Alpha Theta

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U.S. Army

U.S. Navy

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ISEF Finalists

The VSSMF is an all-volunteer organization. Over 80% of the money raised goes to students and their teachers. The remainder goes to operating costs. The money raised comes from 56 financial partners in Vermont who provide gifts or grants from $50-$1000. This year, these partners provided over $13,000 for student and teacher trips to competitions beyond Vermont and expenses. Money also comes from 28 award sponsors in Vermont who provide over $8000 in prizes. In addition to the above money raised by VSSMF, four Vermont colleges provide Next Generation Scholarships totaling nearly $900,000. Finally, our affiliation with competitions beyond Vermont provides another $9,000 to Vermont students and their teachers. We also have judges from 38 STEM partners in academia, industry, and professional organizations.

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