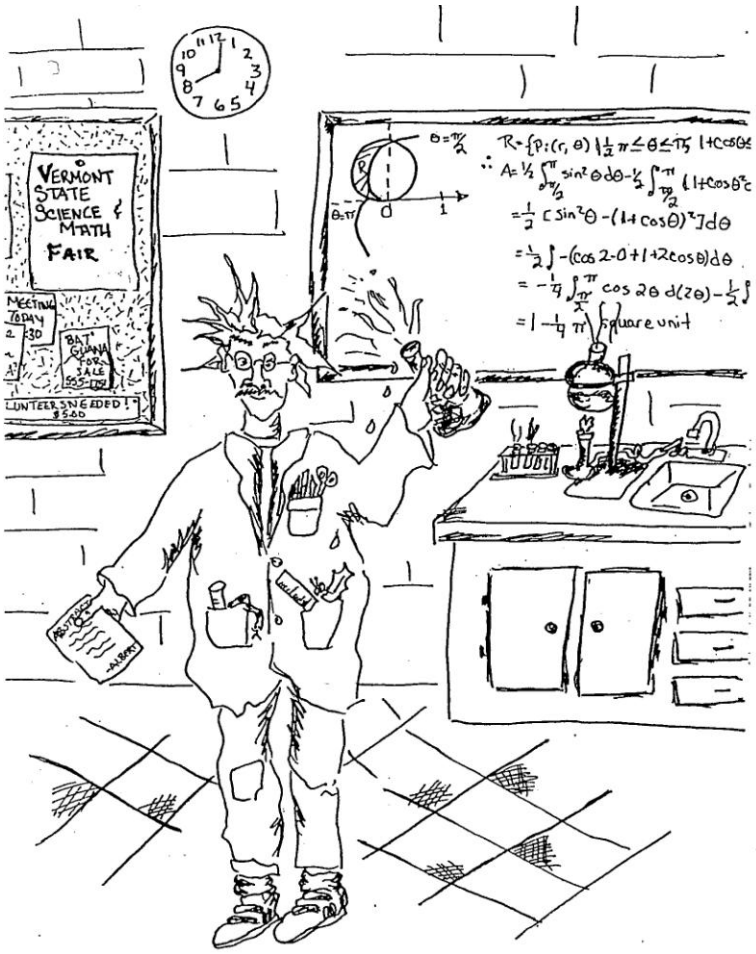
The Vermont State Science & Math Fair

2013 Abstract Book



Norwich University, Northfield, Vermont

April 13, 2013

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

11:00 - 1:30 **University and Museum Exhibits**, 2nd floor Lobby, Wise Campus Center and Lobby of the Sullivan Museum and History Center

Project Numbers & Room Assignments

Subject Area	Project Numbers	Room Numbers
General Biology	B01-B26	243
Physiology	B27-B42	239
Zoology	B43-B48	243
Chemistry	C01-C26	235
Environmental	G01-G30	267
Math	M01-M04	165
Physics	P01-P32	145 & 165
Social Sciences	S01-S23	160 & 176
Group Bio	GP01-GP08	165
Group Chem	GP09-GP10	151
Group Physics	GP11-GP21	151
Group Soc	GP22-GP27	195

Lounges

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

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

Awards Program, April 13th, 2013

VSSMF Awards

VSSMF Silver Medalists
VSSMF Gold Medalists
Vermont Principals' Association

Next Generation Scholarships

St Michael's College
Vermont Technical College
Announcement about Green Mountain College & Norwich University's NG Scholarship winners
Norwich University- top five juniors

VSSMF Local Awards

AllEarth Renewables
American Chemical Society, Green Mountain Local Section
Dufresne Group
Eagle Hill Naturalist
Entergy Vermont Yankee
Ethical Science and Education Coalition
Green Mountain Water Environment Association
GroSolar
Haematologic Technologies
Nathaniel Group
Northeast Branch, American Society of Microbiology
Northeast Section Institute of Food Technologists
NRG Systems
Polhemus
Resource Systems Group
Society of Manufacturing Engineers, Green Mountain Chapter
Society of Women Engineers
Stockholm Junior Water Prize
Superior Technical Ceramics Corporation
Tau Beta Pi
Tcorp
Ted Marsden Memorial Award
Vermont Academy of Arts and Sciences

VSSMF Local Awards, Contd.

Vermont Energy Education Program
Vermont Chapter, Sigma Xi
Vermont Organization of Nurse Leaders

National Awards

Grades 5-8

Broadcom Masters

Grades 9-12

1-SWEEEP
Genius Olympiad

ISEF Affiliation Awards

Grades 5-8

U.S. Marines

Grades 9-12

Professional Awards

American Meteorological Society
American Psychological Association
American Society of Materials
Association of Women Geoscientists
Intel Excellence in Computer Science
Mu Alpha Theta
National Society of Professional Engineers
Ricoh Sustainable Development
Society for In-vitro Biology
United States Metric Association
Yale Science and Engineering Association

U.S. Government Awards

National Oceanographic and Atmospheric Association

U.S. Military Awards

U.S. Army
U.S. Navy
U.S. Air Force

ISEF Finalists

The VSSMF is an all-volunteer organization. Over 80% of the $32,000 raised annually goes to students and their teachers. The remainder goes to operating costs. The money raised comes from 51 financial partners in Vermont who provide gifts or grants from $50-$1000. This year, these partners provided nearly $16,000 for student and teacher trips to competitions beyond Vermont and expenses. Money also comes from 27 award sponsors in Vermont that provide $7000 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 50 STEM partners in academia, industry, and professional organizations. In short, we have a total of 100 Vermont-based partners that share our vision joining us to make the VSSMF a huge success.

The following lists the above Vermont stakeholders who as partners and sponsors, consider investing in YOU NOW to be a wise move so they can employ you in the future when you finish your education!

VERMONT SPONSORING PARTNERS

Applied Research Associates
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ATC Associates
Williston

BioTek
Winooski

Capital Connections
Montpelier

Castleton State College
Castleton

Chroma Technology Corp
Rockingham

Concepts NREC
White River Junction

D.E.W. Construction Company
Williston

DeWolf Engineering
Montpelier

Dufresne Group
Windsor

EF Wall
Barre

Engleberth Construction
Colchester

Entergy Vermont Yankee
Vernon

Environmental Compliance Services
Brattleboro

Fairbanks Scales
St Johnsbury

FairPoint Communications
South Burlington

First Wind
Sheffield

Goodrich Corporation:
United Technologies Corporation
Aerospace Systems
Vergennes

Green Mountain Antibodies
Burlington

Green Mountain Power Corporation
Colchester

Haematologic Technologies
Essex Junction

Hallam, ICS
South Burlington

Husky Injection Molding
Milton

IVEK Corporation
North Springfield

Johnson State College
Johnson

LORD Corporation-Microstrain
Williston

Lyndon State College
Lyndonville

Med-Associates
St. Albans

Mylan Technologies
St Albans

New England Research
White River Junction

Northfield Savings Bank
Northfield

Norwich University
Northfield

Norwich University Applied Research Institute
Northfield

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Proctor

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Physician's Computer Company
Winooski

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Colchester

Stantec
South Burlington

TelJet Longhaul
Williston

University of Vermont
Burlington

Vermont Energy Partnership
Montpelier

Vermont EPSCoR
Colchester

Vermont Gas Systems, Inc.
Burlington

Vermont Principals' Association
Montpelier

Vermont Systems, Inc
Essex Junction

Vermont Technical College
Randolph Center
Vermont Technology Council
Burlington

Washington Electric Co-op
East Montpelier

Wright & Morrissey
South Burlington

VERMONT AWARD SPONSORS

Vermont Principals' Association
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AllEarth Renewables
Williston

American Chemical Society, Green Mountain Local Section
Burlington

Dufresne Group, Consulting Engineers
Windsor

Eagle Hill Institute
Steuben, ME

Entergy Vermont Yankee
Vernon

Ethical Science and Education Coalition
Boston, MA

Green Mountain Water Environment Association
Montpelier

GroSolar
White River Junction

Haematologic Technologies, Inc.
Essex Junction

I-SWEEEP Runner Up Award
Northfield

Nathaniel Group Inc.
Vergennes

Northeast Branch, American Society for Microbiology
Northfield

Northeast Section, Institute of Food Technologists
Natick, MA

NRG Systems
Hinesburg

Polhemus
Colchester

Resource Systems Group
White River Junction

Society of Women Engineers, North Country Section

Stockholm Junior Water Prize
Montpelier

Superior Technical Ceramics
St. Albans

Tau Beta Pi, Norwich University Chapter
Northfield

TCORP
Colchester

Ted Marsden Memorial Award
Northfield

Vermont Academy of Arts and Sciences
Northfield

Vermont Chapter, Sigma Xi
Northfield

Vermont Energy Education Program
Burlington

Vermont Organization of Nurse Leaders
Montpelier

VERMONT PARTNERS PROVIDING JUDGES

Vermont Post-Secondary STEM School Partners

Middlebury College
Middlebury

Norwich University
Northfield

University of Vermont, College of Engineering and Mathematical Sciences

University of Vermont
Medical School
Burlington

Burlington Vermont Technical College
East Randolph

Saint Michael's College
Colchester

Dartmouth College
Hanover, New Hampshire

Vermont STEM Professional Partners

American Chemical Society, Green Mountain Local Section

Vermont Entergy Women in Nuclear

Green Mountain Water Environment Association

Northeast Branch, American Society for Microbiology

Society of Women Engineers, North Country Section

Tau Beta Pi, Engineering Honor Society, Norwich University Chapter

Vermont Academy of Arts and Sciences
Vermont Chapter of Sigma Xi

Vermont Organization of Nurse Leaders

Vermont Academy of Science and Engineering

Vermont Astronomical Society

Vermont Genetics Network Outreach

Vermont STEM State & Federal Government Partners

Fish & Wildlife/Agency of Natural Resources
Waterbury

U.S. Army
Northfield

US Navy
White River Junction

US Air Force
Burlingtion

Vermont STEM Industry Partners

AllEarth Renewables
Williston

Blue Cross, Blue Shield of Vermont
Berlin

Carbon Catalyst
Burlington

Central Vermont Medical Center
Berlin

D.E.W. Construction Corporation

Hughlett Technical Services
Waterbury

IBM (International Business Machines)
Essex Junction

Island Innovations
Grand Isle

LORD Corporation-Microstrain
Williston

Nathaniel Group
Vergennes

Northfield Dental Group
Northfield

Northfield Elite Dental
Northfield

Phoenix Chemical Services
North Ferrisburg

Polhemus
Colchester

Precision Bioassay
Burlington

Resource Systems Group
White River Junction

UTC-AS, Goodrich,
Vergennes

VELCO
Rutland

Vermont Energy Education Program,
Burlington

Weston and Sampson Engineers, Inc.
Waterbury

NAME(s) **Kyle McLane** PROJECT NUMBER **P19**

SCHOOL FHTMS GRADE 7

TEACHER Amelia Lutz

PROJECT TITLE **Reaction Times**

ABSTRACT

For my experiment I have chosen to test how age and gender affects reaction time. I was unable to find any studies on this subject prior to the start of my experiment. The hypothesis is that the people that are in middle to high school will have the fastest reaction time but the gender will not matter.

To collect data for my experiment, I will have 5 people of different genders per 5 different categories. They will all take part in the same two reaction time tests. For one of the tests, I have a computer reaction time tester that they will play three times and their average reaction time out of the three will be recorded. For the second test, I will hold a yard stick in between their fingers at the 10 inch mark. I will drop the yardstick 3 times and their average will be recorded in inches.

So far, my tests are not complete, however from what I have so far it looks like the age doesnÆt matter until you are in the over 50 category. This is where the numbers have been rising the highest.

NAME(s) **Hannah Achilles, Nicole Towne** PROJECT NUMBER **GP11**

SCHOOL Windsor Jr/Sr High School GRADE 8

TEACHER Jennifer Townsend

PROJECT TITLE **Natural Filters**

ABSTRACT

Our project was on Natural Filters. In our project, we used several natural materials to filter water. The purpose of our project was to find a simple, effective, inexpensive way to filter water without harmful chemicals.

To filter our water, we had to decide which natural materials we would use to filter water. We discussed that our materials would have to be abundant and easily found in any environment. We designed our project so that in a desperate situation, like hiking or getting lost in the woods, you could easily build a filter to make your own clean, drinkable water. After considering all of these things, we ended up with four materials, large rocks, small pebbles, fine grained sand and compost soil.

Next we had to build a filter that could be easily built and carried with you. We used two simple, effective materials for our filter, a metal funnel and a clear graduated cylinder. We then placed the funnel on top of the graduated cylinder, and changed the material in the funnel for each individual trial.

○We found that your materials would have to be washed or they could drain more dirt into the water. We used the clean materials in the final trials. We then had to create a semi-natural undrinkable water. We poured the dirty water through each natural material and recorded the three best trials for each.

○We had a very difficult decision when it came to which filter purified the dirty water the best. The tough decision was between the results of dirt and sand. They were almost the same, slightly clear color. We needed a better way

NAME(s) **Shauntel Alger**

PROJECT NUMBER **P01**

SCHOOL Rutland High School

GRADE **10**

TEACHER Deborah Rodolfy

PROJECT TITLE **How is Sound Affected by Density?**

ABSTRACT

Have you ever wondered why two instruments, such as the violin and viola, can look so similar yet sound so different? Many qualities affect the sound, and the quality I examined was the density of the medium and how it affects the sound produced. The density of the medium is a key to determining the sound. For my experiment I mixed sugar and water and placed the solution into a glass cup, and then, by running my finger along the edge of the cup, I was able to produce a sound. The amounts of sugar I used were five, seven, ten and fifteen tablespoons. The lowest density, 1.18g/mL, produced the highest note, 2B#. The solution with the highest density of 1.36g/mL, produced the lowest note, 5A#. According to my research this is exactly how the results should have looked, and that I hypothesized correctly by stating that the most dense mediums produced the lowest notes.

NAME(s) **Sabrina Allain, Keagan McNamara**

PROJECT NUMBER **GP27**

SCHOOL Avalon Triumvirate Academy

GRADE **11**

TEACHER Amanda Gifford

PROJECT TITLE **Texting and Driving**

ABSTRACT

Have you ever tried rubbing your stomach and patting you head at the same time? It is tough to focus on a task when you are distracted doing something else. Texting and driving is a very difficult task. According to stoptextstostopwrecks.org, ôFive seconds is the average time your eyes are off the road while texting. When traveling at 55mph, thatÆs enough time to cover the length of a football field.ö According to the government, 3,092 people were killed due to texting while driving in 2010.

○It is hypothesized that while the test subject is driving during the control test, they will have a lower rate of crashing than they would while texting or talking on the phone. The investigation showed how a distraction can affect your focus on a task. It was tested without any distraction, while texting, and talking on the phone. An online texting and driving simulator was used to emulate real life. Each person was tested with no distractions besides driving, while they texted, and talked on the phone.

○The control had no texting and no talking on the phone. It was discovered that it is very risky and deadly to text and drive. There was a higher crash rate while texting and a lower crash rate while talking, in most cases. For some people, texting was easier than talking. During the control tests, people went further during the drive than they did while using the phone. There were mistakes in the text messages because the test subjects were too busy paying attention to the road. No one made it to the end of the simulator; there were too many insane drivers on the road that would pull out in front of you, and make you crash. The hypothesis was proved correct.

NAME(s) lana alnamee

PROJECT NUMBER S01

SCHOOL Fredrick H. Tuttle Middle School

GRADE 7

TEACHER Christopher Towle

PROJECT TITLE **How do you Learn Best**

ABSTRACT

My project is about the way people learn. Is it visual or audio information? Everyone learns differently. Some people learn better if they are shown information or if they hear the information to try this test here are some tips to do this test. First needed to make a date table for testing and putting the information in. than a sideshow had to be made for the test. That sideshow had ten sides of fruits and vegetables to show to a student for five seconds each. After showing all the sides give the student ten seconds to think after giving the ten seconds have the student say what the student remembers. After showing the sideshow, use a recording of different fruits and vegetables. After the student listens to the recording give the student ten seconds to think than have the student say what they remembers than write down the amount of fruits and vegetables. The result showed that people learn faster if they are shown the information. that means that than an image is shown to the student it leaves an image in their heads. That way they would be able to remember it easier. If a recording is used to remember the information it wouldn't work every well because there isnÆt a image to leave in a studentÆs brain.

NAME(s) Rashad Alsaffar

PROJECT NUMBER G01

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Bioremediation: Cleaning up Oil Spills in Aquatic Biomes**

ABSTRACT

The purpose of this experiment is to test the effects of bioremediation on oil spills; cleaning up oil spills in a safe/harmless way without harming the habitat or any of its inhabitants. My goal in this experiment is to accelerate the bacteria-consumption process by changing the temperature for each group, control and experimental. I believe that temperature change will in fact interfere with bioremediation effects; however, I do not have a specific temperature in mind.

The control group will consist of a test tube containing a small sample of motor oil with ocean water, and nutrients as food for the bacteria, all at room temperature. There will be two experimental groups; each will have the same materials within the test tube as in the control, however one group will be in a very cold climate, while the other in a very hot climate. The dependent variable is the rate at which the bacteria degrade the motor oil. The independent variable is temperature. We will mark the amount of motor oil deposited into the test tube and measure it gradually every day.

Data results are not available at this time; however I am expecting change in bioremediation effects as temperature changes. These results can help us discover what the best environment is for bioremediation to occur. In addition, this knowledge will spread across the world and will be taken into good use.

More information about bioremediation studies will help environmental scientists discover new ways of cleaning up the environment safely.

NAME(s) Taylor Ampatiellos
PROJECT NUMBER P02
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **Hydro-Harmonics: The Study behind Water and Music**

ABSTRACT

In this experiment, I tested whether the amount of water in a glass affects the pitch linearly or exponentially. My hypothesis was that if the amount of water in a glass increased at a linear rate, then the pitch would also increase at a linear rate. As I had not accounted for certain variables when I set out to prove my hypothesis, I had to keep revising my procedure to ascertain greater accuracy in my results. I changed the number of glasses I used to replicate the musical scale, I used two different size glasses to confirm my initial results, and I went from using a pitch pipe to using an electronic chromatic tuner. I eventually felt confident that I was able to prove that my hypothesis was correct.

I finally found that the pitch of the larger glass (with a diameter of 3-3/16ö) increased at a rate of one half-note per every 56.4432 mL of water added. The pitch of the smaller glass (with a diameter of 2-11/16ö) increased at a rate of one half-note per every 30.4306 mL of water added.

Though this project does not really have any topical research applications, it does shed some interesting light on how water effects sound, how sound generated by a glass has a linear relationship to the amount of water in a glass, and how beautiful music can be made by combining these two common things found in everyday life: glass and water.

NAME(s) Emily Antonivich
PROJECT NUMBER C01
SCHOOL Weathersfield School
GRADE 8
TEACHER David E. Lambert

PROJECT TITLE **Brand vs Damage**

ABSTRACT

○My problem was: ôDoes the price of hair dye affect the amount of damage to your hair?ö I picked this topic because I can relate to it. IÆve dyed my hair a variety of colors and suffered the consequences of the damaging bleach and other chemicals.

○Before I formed my hypothesis, I learned about the chemicals contained in hair dye and their purposes. I learned that bleach and ammonia are the main ingredients and they are the most damaging as they strip the hair of its color. Conditioning agents are what smooth broken hairs back out and somewhat return them to their original state.

○In my hypothesis, I said that cheaper dyes were going to have less conditioning agents and more bleaching agents, causing more damage.

○During my experiment, I first gathered hair into groups of 200 hairs. Then, I hot glued the ends together so no hairs would fall out while I was rinsing it. I prepared each dye separately and laid the hairs on sheets of paper according to brand. I labeled each bunch of hair with the test number and the first letter of the brand of dye I would be using, like 1G. I applied each brand of dye to 4 bunches of hair and let it sit for 25 minutes. Then, I rinsed the hair with warm water and applied LoÆreal smoothing shampoo. I rinsed the hair again and applied the conditioner that came with the hair dye I was using on that group of hair. I laid the hairs on paper to dry completely, and repeated the process again. I counted all the split ends out of each group of 200 hairs.

○During my experiment, I observed that the price was irrelevant to the amount of bleaching agents in the dye.

NAME(s) marissa arduca
PROJECT NUMBER C02
SCHOOL rutland high school
GRADE 10
TEACHER anne marie mahar
PROJECT TITLE cosmetic chemistry

ABSTRACT

For my project I tested weather a heat lamp of a full head dryer oxidized hair color faster. I took 16 hair samples, applied color to each one, timed them for a specific amount of time, and began recording my data. I began with five minute intervals, and ended up having to do one, two, three, and four minute intervals as well; this is because there wasn't a clear color difference in the five minute trials. To get a clear color difference I had to do the smaller time trials, so that it could be more noticeable to the human eye. My initial time limit was 20 minutes; This is because the hair stylist I consulted told me that they were taught that you have to process the hair color for 20 minutes regardless of the heat source. My goal was to prove this statement wrong. I hypothesized that the heat lamp would oxidize the hair color faster than the full head dryer because it's a more direct heat source. I concluded that the heat lamp does oxidize the hair color, about five minutes, faster than the full head dryer. With my results I was able to calculate the time I could save the stylist; as well as being able to calculate that at an average of 12 colors a week, saving five minute on every color adds up to eight time for two extra hair cuts a week. I decided to further my research into the conservation of energy. I looked into the wattage of the light bulbs in the heat lamps as well as the amount of energy used by the full head dryers per minute; I was able to figure how much energy each heat source would use for an average process as well as my modified time for a color process.

NAME(s) Melissa Arioli
PROJECT NUMBER B01
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton
PROJECT TITLE Pathogenic Bacteria on Household surfaces

ABSTRACT

This experiment will test how the material that pathogenic bacteria are applied to affects their survival, as well as which method of disinfecting proves most successful. The pathogenic bacteria are: E. coli, Salmonella, Campy, and Listeria. They will be placed on four different types of surfaces commonly found in the home: ceramic, wood, plastic, and steel.

The first part of the experiment will test whether the surface on which bacteria are placed affects their survival. A small sample of each type of bacteria will be placed on each surface. From there, samples will be taken and placed on bacteriology media at fifteen minute time intervals, starting at 0 minutes, then 15, and finally at 30 minutes. After 24 hours the media will be examined to see how long each type of bacteria could survive on different surfaces and the rate of decline of the bacterial colonies. Presently, the data collection is incomplete, but the hypothesis is that the surface the bacteria are placed will affect their growth.

A second experiment will test different washing and disinfecting methods to see which proves most successful in removing bacteria. A standard amount of each type of bacteria will be applied to each surface. Then the surfaces will be washed with water, dish soap, and bleach. After each washing a swab will be taken and placed on bacteriology media. It will then be examined next to another sample taken before the washing to see which method is better at removing bacteria. The hypothesis for this experiment is that bleach will be most effective at removing the greatest amount of bacteria.

NAME(s) Sharvari Athalye
PROJECT NUMBER G02
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Finding the Best Herbaceous Plant Buffer to Limit Phosphorus and Algae Content in the Lake**

ABSTRACT

Lake Champlain Basin contains many farms that raise crops along its tributaries. Agriculture exposes the lake to phosphorus fertilizers. The purpose of this experiment is to evaluate and determine which plant best acts as a buffer in order to limit the amount of phosphorus percolation and algae content in the lake. It is hypothesized that legumes will prove to pick up the most phosphorus and help to limit the amount that goes into the lake which in turn limits algae blooms.

Three of the four experiments will have different types of plants (Wild flowers, Green Beans, Winter Rye), and the fourth experiment contains just soil. This plant-free container is the control group of the experiment while the other three are experimental. The dependent variables are the levels of phosphorus and algae present in the water following the experiment, whereas the independent variable is the phosphorus fertilizer.

Preceding the experiment, the water from Lake Champlain will be tested for its initial phosphorus levels. The initial algae content will be tested by using a turbidometer and microscopic examination. After the seepage of the phosphorus fertilizer into the water, the phosphorus content as well as the algae content will be tested to see if any of the numbers have increased. At this time, data collection is incomplete; however due to background research, it is assumed that legumes will prove to be the best buffer in acting as a medium to reduce phosphorus and algae levels in the lake.

NAME(s) Roger Barraby
PROJECT NUMBER C03
SCHOOL Windsor High School
GRADE 11
TEACHER Jennifer Townsend

PROJECT TITLE **Comparing Calories in Different Food Groups**

ABSTRACT

I am a runner. I have a well-developed exercise regimen but do not understand how to build my diet; specifically at a track meet where I would need quick energy. What types of foods give you the most energy? This is where the calorie comes in. A calorie is a unit of energy defined as the amount of heat required to raise 1 gram of water 1 degree celsius. I sought out to test foods at a small level and find the amount of calories in certain foods.

- My hypothesis was that dairy foods would have the most calories. I tested this using a homemade calorimeter. I lit a piece of food on fire and placed it underneath a can of soda suspended in the air. There was water inside the can, which was at room temperature. The temperature change of the water from the burning food multiplied by the amount of water in the can was the number of calories in the food sample.
- I found that grains contained the most calories. Grains contain lots of carbohydrates and are lower on the trophic level. This explains why they would have many calories, since they are meant to be eaten by all creatures for energy.

NAME(s) **Ali Barron**

PROJECT NUMBER **G03**

SCHOOL South Burlington High School

GRADE 9

TEACHER Curtis Belton

PROJECT TITLE **Effectiveness of Water Drainage Systems**

ABSTRACT

The purpose of this experiment is to find out whether new water drainage and filtration measures are effective and if so, how effective they are. This will be conducted at two different locations, on two different occasions, in South Burlington. The water sampling will be gathered at a total of ten pre-planned points. It is hypothesized that the more measures implemented on a source of run-off, then the phosphates found in the water and the turbidity will be lower.

For this experiment, the control group will be water sampled from an area lacking any major form of water drainage methods, the water spout next to The Windjammer restaurant in South Burlington. The experiment group will consist of a series of drainage ponds off of Kennedy Drive.

Although the data collection is not yet complete, the expected results are that there will be significantly lower levels of phosphates and turbidity in the water collected from the drainage ponds. Along with this the further from the input at which the sample is collected in the series of drainage ponds, then the lower the levels of the turbidity and phosphates. This data will be compared, relative to each other and it will be determined at what point in the drainage ponds the lowering of levels stops or slows to a pace where the cost of building and maintaining far outweighs the benefits provided.

The data collected can be used to help determine at what point the cost of drainage methods outweighs the benefits.

NAME(s) **Blair Bean**

PROJECT NUMBER **S02**

SCHOOL South Burlington High School

GRADE 10

TEACHER Mr.Curtis Belton

PROJECT TITLE **How do Study Patterns Impact Test Anxiety?**

ABSTRACT

The purpose of the experiment was to determine whether study patterns impact test anxiety in high school students. Test anxiety is something that many students deal with but little research has been done on what students can do before the testing date to make them more relaxed. It is hypothesized that students who study on a more consistent basis during the days leading up to the test will be less anxious going into the test.

The high school students who were tested were each tested twice so that they served as their own control and experimental groups. More than 50 students were tested. The dependent variable was how anxious a student was which was measured by taking heart rate, blood pressure, and having each student take a survey describing their physiological and psychological symptoms of stress. . The independent variable was the amount of time each student had spent preparing and how consistently they had studied. Students were tested once on a normal school day without a test in that class. They were tested again directly preceding a formal examination.

ôThough the data collection is incomplete at the moment, it is expected that students who have spent more time studying will be less anxious on testing days. All the data collected will be compiled so that each participantÆs data can be analyzed individually or as a part of a group. The data will be analyzed by comparing the group of students in each category of study habits to one another.

NAME(s) Noah Beatty
PROJECT NUMBER G04
SCHOOL South Burlingotn High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **The Effects of Road Salt on Plants**

ABSTRACT

The purpose of this experiment was to determine the effects of road salt on living plants. In this experiment, it is hypothesized that road salt will prove detrimental to the physical health of plants, particularly shown in the leaves and stems of the organisms.

The control group of plants in this experiment will be treated only with tap water each day. The dependent variable of this experiment is the physical health of the plants, which includes leaf color and stem rigidness. The independent variable is the road salt being added to the plants. Before the experiment is begun, all plants will be treated only with water until they reach maturity. The plants will be photographed in order to determine leaf color and rigidness. Every seven days, the plants will again be photographed.

Data collection is incomplete, however it is expected that the plants will demonstrate negative physical effects when the road salt is applied. The pictures will show whether the plants were affected or not.

This is applicable to real plants on Vermont roads that are exposed to large quantities of road salt each year.

NAME(s) Mercy Beaudoin
PROJECT NUMBER B02
SCHOOL Saint Francis Xavier
GRADE 7
TEACHER Mary Ellen Varhue

PROJECT TITLE **Grow Grow Grow**

ABSTRACT

Oil spills are devastating disasters and happen without warning. Environmentalists, with good intentions, try to find a way to clean up the mess. But are they making things worse?

My project was to see if the cleaners used to clean oil off plants have a more negative affect than just the oil. My hypothesis was the chemicals would get into the plant and stop growth.

My procedure was to put soil in five containers. In each container I put about fourteen seeds two centimeters deep. Then I watered them each day with fifty milliliters of water until they sprouted. I picked the best ten plants, out of fourteen plants, in each container. I measured the plants, averaged them. Then I put one milliliter of oil on four of the five containers and five milliliters of Dawn dish detergent-water mixture on two of the containers with oil. I left one container controlled. After I put the oil and Dawn on the plants I watered the plants each day with one hundred milliliters. The last day I measured them again.

The results showed that the cleaner had a more negative affect. I noticed the day after I put the oil and Dawn on the plants, they completely died. I also noticed, whenever I watered the plants the Dawn would come back up to the surface bubbling. The controlled plants were the healthiest. The plants with just oil grew but werenÆt as healthy as the controlled.

My conclusion was my hypothesis was correct. The plants with the oil and cleaner were the unhealthiest and barely grew. It would have been better to leave the oil on and just use water. I would have liked to have seen the radishes full grown to get a better look at the final result.

NAME(s) TJ Beaumier
PROJECT NUMBER M01
SCHOOL Avalon Triumvirate Acedemy
GRADE 10
TEACHER Amanda Gifford

PROJECT TITLE **Prime Patterns?**

ABSTRACT

Prime numbers are numbers whose only factors are one and themselves. The only even number that is also a prime is two, because all other even numbers have two as a factor. This leads to some interesting events if you work with primes in math. It is hypothesized that there is actually a pattern in the way these primes exist, and that the method using a Fibonacci's triangle that was created for this experiment will show that in a clear way. This test is quite simple, using only paper and a pencil, given a calculator for the longer math. In this test, the Fibonacci's triangle is actually up-side down, due to a need to condense the quantity of numbers, not grow them. At the top, a line of primes is written in, starting with two and increasing and moving to the right from there. Next, the usual math that happens in a Fibonacci's triangle happens, and much addition is done. After a time, it becomes clear that there is a high density of prime numbers recurring on the left side. By studying the way the primes show up here, a pattern was hoped and hypothesized to be found. After long hours adding and testing, however, it became clear that there was no way to be sure of any pattern on this scale. Therefore, simply judging by the data that is available so far, there are ways to reasonably predict and guide the discovery of primes, but not pattern can be found.

NAME(s) Ben Blackmore
PROJECT NUMBER S03
SCHOOL The Renaissance School
GRADE 6
TEACHER Caryn Shield

PROJECT TITLE **Books and the Internet: Polar Opposites**

ABSTRACT

In my project, I tested how the source of media affects comprehension. My project was aimed to discover if you comprehend off the internet better than from a book.

For many generations, books have been the only source of taking in media. Even until recently, the net- a major invention- did not exist. I decided to do this project when I began to read and hear criticism of the internetÆs effects on comprehension and on the brain.

After some research, I hypothesized that the book comprehension would be higher because of a phenomenon that is caused by the internet: the forcing of information to filter through the short term memory before entering the long term memory. This is called cursory thinking, which is a major cause of superficial learning and most likely will lower comprehension.

For my tests I found two articles of similar length, difficulty, and subject: one on NationalGeographic.com and another in World Book Encyclopedia. I collected volunteer test subjects of the same age group, and had each individual read the internet and book articles and take a seven question test for each source.

I tried to prevent human error as well as possible by having each test subject in isolation and under the same surroundings during testing, and by not allowing subjects to converse about the tests.

My data showed that most of what I had read and heard was correct. I found a surprising 29% difference increase in book comprehension over internet comprehension. Not only was the book better than the internet in comprehension, but the time it took the average subject to read the internet article was about twice as long as the book time.

My conclusion is that reading from books will help your comprehension and save you time.

NAME(s) **Amanda Bloom**

PROJECT NUMBER **P03**

SCHOOL Mater Christi School

GRADE 7

TEACHER Mark Pendergrass

PROJECT TITLE **What's Your Beat?**

ABSTRACT

The purpose of this study was to determine what relaxation technique (RT) would lower your heart rate (HR) in beats per minute (BPM) the most following exercise. The hypothesis stated if the subject ran 0.25 miles on a treadmill at the speed of 5 miles per hour (MPH) and then performed deep relaxation breathing, then their HR would decrease the most compared to listening to calming music and progressive muscle relaxation. Research indicated that active people would have a lower HR at rest and after exercise versus their non-active peers. Research has also shown that RTÆs including deep breathing exercises, listening to calming music, and progressive muscle relaxation has proven to lower HR post exercise. In order to increase reliability in this experiment the 10 subjects were between the ages of 9 and 13, the same treadmill was used for consistent speed, the same person was used to check HR, and a script was used to instruct the subjects in the RTÆs. Participants signed a consent form describing the procedure and instructed them to wear a safety clip while running on the treadmill. The data collection process consisted of measuring and recording HR prior to exercise, after 0.25 miles of running, and after each RT for all subjects. The original hypothesis that deep breathing relaxation would decrease the HR the most proved to be incorrect. Talkative subjects and varying fitness levels may have effected data collection.

The analysis concluded that listening to calming music for 1 minute following exercise lowered the HR the most by an average of 20 BPM.

NAME(s) **Nick Blow, Bradley Romeo, Braxton Williams**

PROJECT NUMBER **GP13**

SCHOOL Barre Town Middle School

GRADE 8

TEACHER Jennifer Aither

PROJECT TITLE **Water Filtration**

ABSTRACT

This project is an exploration of how school water fountains filter water in order to make it drinkable for students. We explored the reasons that different fountains throughout the school have different readings for hardness. We also made connections to how water is filtered in the Earth and water cycle.

NAME(s) **Victor Boardman**

PROJECT NUMBER **B03**

SCHOOL South Burlington High School

GRADE 9

TEACHER Curtis Belton

PROJECT TITLE **Effect of External Stimuli of the Stomata of Plants**

ABSTRACT

The purpose of my lab is to discover the response of stomata to different external stimuli. The four external stimuli that will be involved in this experiment are sunlight, carbon dioxide, temperature and the amount of water the plant receives. While the experiment is being performed, it can be hypothesized that light will cause stomata to open, an increase in the amount of carbon dioxide will cause closure, lack of sufficient water will cause closure and an increase in temperature will cause the stomata to open.

For this experiment, the control group would consist of a plant that receives sufficient sunlight, water, carbon dioxide and is in a temperature controlled room. In the experimental group, there will be four different plants. Each one will have a variable that differs from the control. One plant will receive everything but no sunlight. The next plant will not receive enough water. The third plant will be put in a box to cut off access to carbon dioxide and the fourth plant will be put in a freezer to alter the temperature. The dependent variable is the opening/closure of the stomata of these plants while the independent variables are the external stimuli that we expose the plant to.

I havenÆt yet started collecting data but I expect that the changes made to the external stimuli will prove my hypothesis to be correct

NAME(s) **Grace Bodykevich, Marley Beers**

PROJECT NUMBER **GP15**

SCHOOL Frederick H. Tuttle Middle School

GRADE 7

TEACHER Christopher Towle

PROJECT TITLE **Eggseptioanllly Strong Eggs**

ABSTRACT

The purpose of this experiment was to see if eggs withstood greater force standing up or on their sides and if either white eggs or brown eggs were stronger. The hypothesis was that eggs would withstand greater force standing up. The shape of the egg standing up is a dome, and the dome shape distributes weight well. The test was performed by releasing marbles through a cardboard tube onto an egg, this insured that weight was distributed evenly in every trial. The marbles all weighed the same weight of 0.2 ounces. There were six trials for each combination of egg. The results showed that white eggs standing up withstood an average of 52 marbles, the white eggs on their side withstood an average of 12 marbles, the brown standing up withstood an average of 16 marbles, and the brown on their side withstood and average of 16 marbles. In conclusion white eggs standing up withstand the most weight.

NAME(s) Jean-Baptiste Bolh

PROJECT NUMBER B27

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **The Effect of Exercise on the Prefrontal Cortex**

ABSTRACT

The purpose of this experiment was to determine how exercise affects the prefrontal cortex. ôSparkö by John Ratey shows the effect on a wide scale with 19,000 students from a school district in Illinois. This part of the brain controls all cognitive functions. In conducting this experiment, It is hypothesized that more exercise will improve all cognitive functions.

The test subjects will be made up of studentÆs at South Burlington High School. There will be 20 test subjects that do vigorous sports such as soccer and track, and 20 that donÆt. Those who donÆt practice sports will be the control group and those who do practice sports are the experimental group. There will be three tests to examine the different cognitive abilities of the students. Each student will take the tests individually for a set period of time. The dependent variable is test results for each type of test as well as for the average performance on the three tests. The independent variable is vigorous sports. After they are done, the data will be analyzed for values such as average and correlations. From there, a relationship will be identified between the students who take sports and their cognitive abilities compared to those who do not.

Data collection is incomplete at the moment. Once complete it is expected that the students that participate in vigorous exercise will outperform those who do not.

New discoveries involving exercise and its effect on the brain could be used to implement exercise programs in schools.

NAME(s) Natasha Brightly

PROJECT NUMBER G05

SCHOOL Northfield Middle High School

GRADE 11

TEACHER Mrs. Tomczyk

PROJECT TITLE **The Effect of Various Substances on the Voltage Produced in a Solar Cell**

ABSTRACT

Two experiments were composed of finding the effect of different amounts of condensation in a sponge on voltage in a solar cell and the effect of different amounts of snow on the voltage in a solar cell. The procedure for the condensation experiment is; place sponge with water(or no water) in aquarium with solar cell, cover aquarium with plastic wrap, turn on heat lamp, turn on voltage reader, wait for 10 minutes, record voltage, and shut off reader and lamp. Repeat steps for other amounts of water. The procedure for the snow experiment is; take away sponge and aquarium from previous experiment, place heat lamp above the solar cell at a 45 degree angle, turn on the heat lamp, wait 10 minutes, record data, and shut off lamp. Repeat steps for the different amounts of snow. The findings for the amount of voltage produced in a solar cell for 0mL, 5mL, 10mL, 15mL, and 20 mL of condensation in aquarium are 0.473V, 0.472V, 0.466V, 0.443V, and 0.438V respectively. The findings for the amount of voltage produced in a solar cell for 0cm, 0.635cm, 1.27cm, 1.905cm, and 2.54cm of snow on solar cell are 0.495V, 0.566V, 0.540V, 0.508V, 0.529V respectively. The trend for the condensation experiment was that the more water added to the sponge, the lower the voltage collected. The overall trend for the snow experiment was that after snow was put on the solar cell, the voltage decreased.

NAME(s) **Shannon Brodie, Ashley Henry** PROJECT NUMBER **GP23**

SCHOOL Barre Town Middle School GRADE **8**

TEACHER Jennifer Aither

PROJECT TITLE **Fear Factor**

ABSTRACT

This project is an exploration of how fear changes as you age. We tested children as young as 5, middle school students and adults. We looked at primal fears, childhood fears and adult specific concerns.

NAME(s) **Jacob Bee Ho Brown** PROJECT NUMBER **S04**

SCHOOL Main Street Middle School GRADE **8**

TEACHER Eli Rosenberg

PROJECT TITLE **Does Walking Through a Doorway Affect Short-Term Memory?**

ABSTRACT

I wanted to see if walking through a doorway would affect a personÆs short-term memory. I thought that walking through a doorway would decrease a personÆs ability recall memories. I hypothesized this because walking through a doorway into a new room is the same as when somebodyÆs mind has to access different areas of the brain to retrieve memories. Walking through a doorway makes the brain forget some memories because it is in a new environment.

In my experiment I had test subjects look at a sheet with fifteen differently colored shapes and try to memorize as many of them as they could. After thirty seconds I would have them get up and walk across the room. After another ten seconds the test subjects would verbally repeat as many of the colored shapes they remembered and I would record them. Next, I would repeat the process however, this time showing them the second sheet of colored shapes. However, this time, after the first thirty seconds, I would have the test subject walk through a doorway into another room and say what colored shapes they remembered. Then I would record those results and compare them to the first testÆs results.

My data proved that my hypothesis was correct. After reviewing the results I found 85% of the test subjects did experience short-term memory loss after walking through a doorway. On average, the test subjects remembered four fewer shapes after walking through the doorway compared to when they remained in the same room the whole time. I have come to the conclusion that when a person walks through a doorway their memory will be affected, and they will most likely not be able to remember all of the thoughts they had in the room they were previously in.

NAME(s) **joshua brown** PROJECT NUMBER **S05**

SCHOOL randolf homschool GRADE 7

TEACHER gina sweet

PROJECT TITLE **the math noise**

ABSTRACT

My purpose for doing this experiment is to learn if noise really does anything to the quality and the completion of your work. I mainly did it because for most of my life IÆve people say ôI canÆt concentrate because youÆre talking and making noise.ö I wanted to see if it could be proven that noise disrupts our work quality. So I had 20 people take two 100 question test in 3 min. One with this a really annoying noise going and one without. My hypothesis is that the test with noise people will do better on. Because the test with noise is a steady noise not like a real life noise because a real noise is usually followed by another noise. Or even a three word conversation.

This is what happened in my experiment I tested 20 people one test had the annoying noise that would be test 2. Test 1 didnÆt. The majority did better on the one with noise. So if the experiment turned out to be as expected which really isnÆt supposed to happen. If I was to do this experiment again I would do more people. But my final results really were cool no one got lower than 73%.but overall the experiment was fun and I learned a lot.

Thank you for reading my abstract of the math noise Joshua Brown

NAME(s) **Kelsey Bullock** PROJECT NUMBER **B04**

SCHOOL Rutland High School GRADE 11

TEACHER Ann Marie Mahar

PROJECT TITLE **The Effects of Lactobacillus Casei on Probiotic growth**

ABSTRACT

The purpose of this experiment was to test the growth of probiotics in relationship with amounts of antioxidants. I took red and white wine, dark and milk chocolate, and mixed each separately with a probiotic pill solution and spread each onto a petri dish. There were also test petri dishes containing only probiotic bacteria. They were then allowed to grow for 72 hours under a lamp that acted as an incubator. The red wine petri dishes showed the most growth, having an average colony at 10.5 millimeters. The results then continued at 6.5 millimeter average for milk chocolate, 6.25 millimeter average for the test samples, 2.7 millimeter average for white wine, and lastly 1.85 millimeter average for dark chocolate. The dish with the largest growth was red wine 2, at 13.3 millimeter average colony size. The one with the smallest was test 2, which had no growth at all. This corresponds with my hypothesis, which states that the red wine petri dishes would exhibit the most growth out of all the other samples. This is because red wine, out of all of the samples, contained the most antioxidants. This also corresponds with the research found by other scientists around the world.

NAME(s) **Tyler Cain**

PROJECT NUMBER **P04**

SCHOOL Main Street Middle School

GRADE 7

TEACHER Eli Rosenberg

PROJECT TITLE **Don't Get Shafted!**

ABSTRACT

Do the materials in a hockey stick really affect the speed of the hockey shot? I created a short test to help other hockey players find out which hockey stick material is best: wooden, fiberglass, or carbon fiber. My prediction was that the most modern material, carbon fiber, would create the fastest shots. Since carbon fiber is stiffer and lighter than wood and fiberglass, the carbon fiber stick should create the fastest wrist and slap shots.

I conducted an experiment to compare the speed of wrist shots and slap shots from hockey sticks made up of those three different materials. First, I set up the speed gun behind a net eighteen inches high, then set up a four foot piece of plywood twenty feet away from the front of the net. I had three different hockey players each shoot 10 wrist shots and 10 slap shots with 3 different hockey sticks. Each person used a wooden, fiberglass, and carbon fiber stick, resulting in each player taking a total of 60 shots to be measured for data analysis. We recorded the speed of each shot.

The experiment got good results which helped me draw an easy conclusion. My data shows that the carbon fiber sticks created the fastest wrist shots, because of the light and stiff material which allows you to pull back and release the puck the fastest. The fiberglass sticks created the fastest slap shots, because of the flexible material which allows you to get under the puck easier. If you are a defender, you should consider a fiberglass stick to help you create faster slap shots. If you are a forward, then you should consider a carbon fiber stick to help you create faster wrist shots. I donÆt recommend wooden sticks because they consistently created the slower shots.

NAME(s) **Emily Camardo**

PROJECT NUMBER **M02**

SCHOOL South Burlington High School

GRADE 12

TEACHER Gerard LaVarnway

PROJECT TITLE **A Mathematical Investigation of the Geometric Properties of the Arbelos**

ABSTRACT

The arbelos, also know as the "shoemakers knife" is a fascinating structure that has been studied since the time of the early Greeks. The figure is formed by three mutually tangent semicircles with collinear centers. Specifically, we studied Archimedean circles, Dodge circles, Bankoff triples and Woo circles. These ideas were first introduced in a series of mathematical papers published in the 1970's through the 1990's by the Mathematics Association of America.

NAME(s) Peter Camardo
PROJECT NUMBER S06
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **The Effects of Smiling**

ABSTRACT

The purpose of this experiment is to explore the perspective of life while smiling and not smiling. In conducting this experiment, it is hypothesized that the smiling people will enjoy the clip that is presented to them more than the non-smiling. Overall, it is hypothesized that smiling people will enjoy their life more than the non-smiling people.

The control group in this experiment will be a group of subjects watching a clip normally. The experimental group will be a group of subjects watching the same clip, but they will be holding a pencil across their teeth, forcing them to use the same muscles they would use when they smile. The independent variable in this is the pencil that is being held between each subjectÆs teeth, and the dependent variable is the subjectsÆ level of happiness, expressed as how funny they rate the clip.

At the moment, data collection is incomplete, but it is expected that the subjects who have a pencil across their teeth will rate the clip higher, in terms of humor, than the people who are sitting and watching the clip normally; without holding the pencil.

If everything goes as planned, then the experiment will not introduce any sort of new technologies, but it will act as evidence to get people to smile and live more enjoyable lives by doing so.

NAME(s) Griffin Cannon
PROJECT NUMBER B05
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **The Ability of Radish Roots to Filter Bacteria**

ABSTRACT

This experiment is designed to determine whether or not the roots of radishes filter out the bacteria Sarcina Lutea. My experimental group will consist of petri dishes with a to-be determined amount of water contaminated with the Sarcina Lutea and a section of radish root. At the end of the experiment I will measure the density of the Sarcina Lutea in the water. My control group will be the same amount of contaminated water placed in other petri dishes in the same place as the petri dishes with the roots. At the end of the experiment these will be measured for the density of Sarcina Lutea as well. In order to avoid the bacteriaÆs multiplication from distorting my results the water that will be used in this experiment will be contaminated with bacteria then split into two containers (one for the control group and one for the experimental group). In addition the measurement of the bacteria afterwards will happen at the same time for the two groups. I expect that the roots of the radishes will end up filtering out the bacteria in the water but continue taking in the water itself. Because of this I predict that the bacteria density of the bacteria in the experimental group will be noticeably higher than the bacteria density in the control group.

NAME(s) **Talla Caruso** PROJECT NUMBER **B06**

SCHOOL Rutland High School GRADE 11

TEACHER Ann Marie Mahar

PROJECT TITLE **To Febreze or not to Febreze**

ABSTRACT

Talla Caruso To Febreze or Not to Febreze

This project is about Procter and Gambles spray product Febreze. It was developed on accident when a scientist was working with Hydroxypropyl Beta Cyclodextrin (HPBCD.) The man was working on developing a product that completely eliminated odors, and did not mask them, and accomplished this feat with his findings. The product began manufacturing and is still a widely popular household product to day. Due to the popularity surrounding the product, one would like to know if it actually works. Through the cultivating of bacteria on multiple surfaces, it can be observed whether or not the Febreze successfully kills the bacteria. The hypothesis is that the closest distance and longest timeframe in which the Febreze is sprayed will kill more bacteria, especially when using the scented Febreze. Through different variables such as time and distance using both original and scented Febreze, we can draw a solid conclusion as to how effective the product is. By swabbing commonly touched areas like desks, lockers, the floor and a window, and then spraying them with Febreze, we can truly test the effectiveness of it because these areas have high concentrations of bacteria. After the experiment it can be concluded that Febreze does in fact effectively kill bacteria. However, it does so most effectively at a further range as the product dries up and evaporates the odor with it. The longer time frame of five minutes also kills more bacteria, as well as the use of the Original Febreze over the Scented.

NAME(s) **Andrew Cassarino** PROJECT NUMBER **P05**

SCHOOL Rutland High School GRADE 11

TEACHER Ann Marie Mahar

PROJECT TITLE **Breaking the Rules**

ABSTRACT

Question: Will a doctored baseball break more than a regular baseball?

Hypothesis: A doctored baseball will break more than a regular baseball because it will have uneven weight and will be released differently by a pitcher.

Why? I chose this project because I really enjoy pitching and am very curious as to why baseballs break. Also during my season I was wrongfully accused of using Vaseline on a baseball.

Materials:

òoBaseballs
òoPeanut butter
òoVaseline
òoCooking Oil
òoKnife
òoCheese grater

Procedure: I will setup a mound that is 60 feet 6 inches away from a net. I will put a tape measure on the net to see where the ball lands. I will also determine how high the ball is off the ground when it leaves my hand. Each pitch will be thrown 15 times. I will have a camera set up behind the net, which will film each pitch. I will then go back a watch each clip to see how high the ball landed of the net. I will take that number and subtract it from the height of my arm when the ball left my hand to determine its break. To make sure the same amount of substance is being used each time, I will draw a circle with a NUMBER diameter on the ball and only fill that circle with the substance. After I find the break of each ball I will add all the numbers up and find the average break in inches of each pitch with a substance added.

NAME(s) Leah Charash
PROJECT NUMBER B28
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **The Effects of Stress on the Body**

ABSTRACT

The purpose of this experiment is to determine the physiological effects of stress on a human subject. It is hypothesized that when placed in a stressful environment, a subjectÆs heart rate, pupil constriction, respiratory rate, blood pressure, and skin conductivity would increase.

Each subject will serve as their own control. The control period in this experiment consists of exposure to a tranquil situation. The independent variables consist of soft lighting, comfortable seating, ocean sounds, and refreshments if desired. After four minutes of immersion in this environment, the dependent variables heart rate, pupil constriction, respiratory rate, blood pressure, and skin conductivity will be measured.

The experimental group consists of exposure to a stressful environment. The independent variables will consist of bright, flashing lights, loud sounds of a baby crying, and a hard, uncomfortable chair. After four minutes of immersion in this environment, the dependent variables heart rate, pupil constriction, respiratory rate, blood pressure, and skin conductivity will be measured again.

Data collection is currently incomplete; however it is expected that imposed stress will result in a higher heart rate, blood pressure, respiratory rate, pupil constriction and skin conductivity than would be produced by the same test subject in a situation of tranquility.

NAME(s) Lauren Cheney
PROJECT NUMBER P06
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **Hot Wires**

ABSTRACT

My question is "what effect does current have on the size of conductors." I chose this project because I am interested in electricity. My hypothesis is "If I test various wires with varying thickness then the thinner wire will produce more heat, due to the lack of space for electrons to flow." I proved this by attaching two 2 by 4s that are an inch and a half thick to a 2 by 6 piece of wood, three feet apart. Next I attached a terminal strip onto each 2 by 4 and then attached a heating element behind one 2 by 4 and to the terminal strip. On the opposite 2 by 4, I attached a power cord that attached to that terminal strip. I had six different three foot long wires that I tested by attaching each end into a terminal strip. I used the amp probe to determine the current of each wire when it was not plugged in, then again while being plugged. I also tested the temperature before beginning and after eleven minutes was up. While the experiment was plugged in, during the eleven minutes, the current for each wire was about 8.5 amps. After unplugging the power cord and taking the final temperature the thicker wires had very little heat rise and the thinner wires had a greater heat rise. My prediction was right, the thinner wires produced more heat due to lack of room for electrons to flow, causing more heat to be produced.

NAME(s) Hannah Choiniere, Rebecca Cross

PROJECT NUMBER GP12

SCHOOL Missisquoi Valley Union High School

GRADE 11

TEACHER Maria D. Dezotell

PROJECT TITLE **The Impact of Superstorm Sandy on Water Quality in Vermont**

ABSTRACT

The Research on Adaptation to Climate Change at Missisquoi Valley Union High School compared the data of river sites in Vermont during Hurricane Irene and Hurricane Sandy. The team compared the values of phosphorus, nitrogen, and total suspended solids, before and after Hurricane Sandy at Hungerford Brook in Swanton, VT. The team hypothesized that the storm would increase the levels of chemicals at the river site. The experiment was conducted continuously between August 13 and November 07, 2012. The team performed five water collection trials and each trial involved three water samples for both total phosphorus and TSS. The teamÆs data was compared to the data from other river sites around Vermont. All the values pertaining to the phosphorus, nitrogen, and total suspended solids were analyzed before, during, and after the time of the two different storms. It was found that the values are relatively in the same range before the peak of the storm for Vermont. Two days before the stormÆs peak, the values started increasing, and then they dramatically increase during the storm. After the storm, the values of both phosphorus and nitrogen decrease slowly over time. The values of TSS remained a high level for a longer period of time, decreasing much slower than other nutrients. For example, the amount of micrograms of nitrogen per liter of water increased from 899.481 before Hurricane Sandy to 3532.950 micrograms per liter after the storm. The total suspended solids increased from 6.83 to 22.0 milligrams per liter. The phosphorus increased from 41.516 to 162.536 micrograms per liter. The hypothesis was confirmed by the data analyzed: severe storms affect the water quality of the streams by raising the nutrient levels. Moreover, the data collected and analyzed during Irene supported the teamÆs hypothesis.

NAME(s) Sabrina Choudhary, Claire Wright, Kiran Waqar

PROJECT NUMBER GP25

SCHOOL Fredrick H. Tuttle Middle School

GRADE 7

TEACHER Amelia Lutz

PROJECT TITLE **How Distractions Affect (Ooh Look A Butterfly) Concentration**

ABSTRACT

Have you ever read a book in a crowded room and not been able to focus? Has the delicious smell of dinner cooking ever distracted you from finishing your homework? We wondered which sense, when interrupted, most causes people to lose concentration. We developed a test that would appeal to each sense in turn to see if the subject would lose focus on the task they were told to complete. Our hypothesis was that sense of hearing would be most disrupt concentration.

We conducted our test by having middle school students count as many paper clips as they could in a one-minute time period while we placed a distraction in the room. We chose a stimulus for each sense: a scented candle for smell, changes in lighting for vision, a stress ball to play with for touch, playing music for hearing, and eating candy for taste. We used counting without any distractions for a control. We would then draw conclusions by measuring how accurate they were for each portion of the test. Our initial data shows that hearing was the most distracting, as we thought, followed by taste and touch.

NAME(s) Dominic Cicilio, Ryan Gerrity, Nathan Spaulding
PROJECT NUMBER GP17
SCHOOL Northwest Technical Center
GRADE 12
TEACHER Douglass R. Bell
PROJECT TITLE **Load Cell Computer Interface**

ABSTRACT

Our objective is to build an interface that can work with strain gauges to read and graphically display the stress on an object. This is so we may derive the breaking point of that object. The reason for doing this is to find the maximum load an object can withstand without breaking. This information is useful when you engineer structures to be safe for holding considerable loads such as people and vehicles. Part of reaching our final product included figuring out how to amplify our signal correctly so it was readable for the computer interface. We also used Lab View software to create a program set up that displayed our data and made it possible to locate and observe a breaking point. This kind of technology is needed so that engineers can create safe structures and find the best ways to build them. It makes modeling something much larger possible and gives us the tools to find new and innovative ways of building.

NAME(s) Gordon Clark
PROJECT NUMBER P07
SCHOOL Avalon Triumvirate Academy
GRADE 6
TEACHER Amanda Gifford
PROJECT TITLE **EMP's**

ABSTRACT

Originally, this experiment was going to be testing the use of an Electromagnetic pulse on an active bomb or moving vehicle. However it was narrowed down to just a small electric motor, that was placed a certain distance away from the copper coil. It is hypothesized that a small scale EMP generator will partially disable a small scale version of a car motor from about two centimeters away. The experiment was thought up while searching the web for batteries. Directions were found on the internet, but some of the materials were changed because of accessibility. The materials used were twenty gauge copper wire, a PVC tube, an AC power source, and a small motor. The coil was made by winding about twenty feet of copper wire around the piece of PVC and connecting it to the AC power source; this connection was made by separating the positive and negative leads from the power supply and connecting them to the two copper wires at the end of the PVC. Next, the motor was placed two centimeters away from the coil and the power supply was plugged in for a duration of three seconds, then the results were analyzed and put into Microsoft Excel. All in all, this hypothesis was inaccurate, the motor slowed about half the time. Some improvements for if I wanted to do this again might have been to use a flash capacitor to direct all the electricity to one point at one time. Sometime in the near future, EMPs will be used a lot more to either disable missiles or even to send messages, maybe.

NAME(s) Sage Coates-Farley

PROJECT NUMBER P08

SCHOOL Hinesburg Communtiy School

GRADE 7

TEACHER Stephanie Konowitz

PROJECT TITLE **Pull Your Own Weight**

ABSTRACT

I was curious to know if the type of harness a dog wore affected their weight pulling ability. The purpose of this experiment was to tell which harness would be better for weight pulling competitions. I am a musher and I would like to know so our dogs would be able to pull more passenger weight on tours and rides. Freight harnesses are considered better for weight pulling because they are more padded and built to distribute weight evenly across the dogÆs body. Other harnesses like the X-backs supposedly harm the dogÆs back and impact their ability to pull. To prove these theories, I hooked a dog to a seventy pound sled and tested with each harness to see how much extra weight she could pull and in what time. I found that the dog pulled one hundred sixty pounds and made better time while wearing the freight harness. This proves that the freight harnesses are indeed better to pull weight because of their design and extra padding.

NAME(s) Joy Cohen

PROJECT NUMBER B29

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Correlation Between Blood Glucose Levels Measured at Different Sites On the Body**

ABSTRACT

The purpose of this experiment is to determine if bg level testing at alternate sites closely matches results obtained by testing on the traditional fingertip site, and if so, which sites are most accurate. A subsidiary investigation will study whether different dietary conditions (fasting, thirty minutes after eating) affect the accuracy of alternate testing sites.

The control group in this experiment is bg level testing from the finger. The test groups are the palm and elbow. The first bg measurements will be taken when the subject has not eaten for an hour before testing. At that time, the subjectÆs bg level will be measured from the palm, finger, and elbow. The second set of tests will take place half an hour after eating. The second set of tests will follow the same procedure as the first tests and will be taken from the palm, finger and elbow. All measurements will be made using the same bg meter.

Although data has not been collected, it is hypothesized that the palm and elbow bg levels will be very similar to levels from the finger, but the palmÆs will be the closest. It is also hypothesized that the differences between the control and experimental groupsÆ bg levels will be larger thirty minutes after eating.

Investigation on this subject will help diabetics figure out which testing sites they can use and when they should use them. Flexibility of testing site can encourage monitoring in cases where patients experience discomfort due to fingertip monitoring.

NAME(s) **Hunter Cole** PROJECT NUMBER **C04**

SCHOOL Rutland High School GRADE 11

TEACHER Ann Marie Mahar

PROJECT TITLE **Soy Candles: Do They Compare?**

ABSTRACT

The purpose of testing soy wax and paraffin wax candles for differences in burning characteristics was to see if there was any problems that would keep soy wax candles from replacing paraffin wax candles because of the toxins they release. To test my hypothesis, I burned two soy wax candles and two paraffin wax candles in a windless, motionless environment. For every hour the candles burned, I recorded their flame height, flame movement, and wick appearance. I did this until one set of the candles went out. The first set to go out was the set of soy wax candles. The paraffin wax candles had nearly half of their wax still remaining. For differences in burning characteristics, the soy wax candles burned with a larger flame, a less steady flame, and a shorter burning time. The soy wax candles also had a large amount of excess wax on the end of the wick. I inferred that this was because of the soft, weak wax melting and traveling up the wick to quickly to be burned. The paraffin wax candles burned steadily, with a small flame, and long burn time. I came to the conclusion that paraffin wax candles will not be replaced by soy wax candles because of their superior burning characteristics.

NAME(s) **Courtney Connolly** PROJECT NUMBER **P09**

SCHOOL Rutland High School GRADE 11

TEACHER Ann Marie Mahar

PROJECT TITLE **Rosin Affects Sound**

ABSTRACT

Will different colored rosins affect the amount of sound produced from a violin? My hypothesis was if dark colored rosin and light colored rosin is applied to the bow and then played on a violin, the dark colored rosin will produce a higher sound frequency measured in hertz because dark rosin is softer which means it will stick more to the bow as opposed to harder, lighter colored rosins that wonÆt stick to the bow as much. I chose seven distinct colors of rosin from a very light, amber color to a black color. I applied each to the bow twice and recorded the sound on wavepad sound editor software and it graphed the sound measuring it in hertz. I tested each rosin twice to make sure the sound accurate. After each rosin was applied, the bow and the string were wiped off. The results were as the rosin color got darker, the more sound they produced. My hypothesis was proven correctly and even though sound increase was not significant it still increased when the color got darker. The lightest rosin made just over 3000 hertz and the darkest colored rosin made just above 7000 hertz.

NAME(s) ailaini corsones-brown
PROJECT NUMBER P10
SCHOOL Rutland High School
GRADE 11
TEACHER Susan Ponto
PROJECT TITLE **Bowling with Physics**

ABSTRACT

This science fair project tested how the mass of a bowling ball affected how many pins it knocked down. The purpose of doing this science fair project was to understand the physics of bowling better. People, especially bowlers, should care about the work that was done in this experiment because it proved that mass does affect the number of pins knocked down and this can help people bowl better. The hypothesis was that if a 6, 8, 10, 12, and 14 pound ball were rolled off a ramp and down the lane then the 14 pound ball would knock down the most pins because it would gain more speed and have a greater force of impact when it hit the pins. To prove this a 6, 8, 10, 12, and 14 pound ball were rolled down a ramp 10 times each and the number of pins that were knocked down each time was recorded. The results showed that the 6 pound ball knocked down an average of 7 pins each roll, the 8 pound ball knocked down an average of 8.1 pins each roll, the 10 pound ball knocked down an average of 8.6 pins each roll, the 12 pound ball knocked down an average of 9.1 pins each roll, and the 14 pound ball knocked down an average of 9.3 pins each roll. The objectives were met and the hypothesis was proven correct.

NAME(s) Will Couch
PROJECT NUMBER B07
SCHOOL Mater Christi School
GRADE 7
TEACHER Mark Pendergrass
PROJECT TITLE **Bacteria-R-Us**

ABSTRACT

The question for this experiment is if you touch objects more often then will the object have more bacterial colonies. The hypothesis was that they will have more bacterial colonies. In the background research it was learned that instead of looking for individual bacteria the tester had to look for bacterial colonies. Individual bacteria would be too hard to count. The procedure is this: collect the samples, culture them in petri dishes, label the petri dishes, put them in the incubator, wait 24 hours (for the bacteria to grow), count the bacterial colonies, record the number of bacterial colonies. Finally safely dispose of the bacteria. This was followed in the experiment. In the data collection process one would count the bacterial colonies, and look around the petri dishes for other bacterial colonies. As you are doing this look for other unexpected things that you would put in your data table. The hypothesis was proved right that if an object is touched more often then it it will have more bacterial colonies than if an object is not touched as often. In the data collected it was found that a computer mouse had 1 bacterial colony, a clean glass had 1 bacterial colony. Also a cellphone had 100 bacterial colonies,and a door handle had 1 bacterial colony.All the objects were swabbed twice to ensure accuracy. During the swabbing process there were some difficulties spreading the bacteria around the petri dish.

NAME(s) Jacob Curtis

PROJECT NUMBER B30

SCHOOL Windsor Jr/Sr High School

GRADE 7

TEACHER Jennifer Townsend

PROJECT TITLE **Hydration Information**

ABSTRACT

My ProjectÆs purpose was to find out whether or not sports drinks, such as Gatorade or Powerade, perform as thoroughly as they claim. Also, I wanted to know which drink potentially replenishes you the most. To prove my hypothesis right, or not, I ran 360 feet, to see how long the run took. Then, I took my first drink, water. I ran the same distance and measured the time. After that I repeated the process, each with a new drink. This project connects to the real world because of sports. Millions of people will take energy drinks or sports drinks to prepare for sports, or replenish their strengths. With the information from this project, athletes around the world can achieve their best performance. An important factor for my project was the amount of time I gave myself in between my trials. It was crucial that I waited for exactly 10 minutes before starting another run. Also, I tried to eat the same foods every day and wear the same type of clothes. If I changed those things, it could have drastically changed my results.

NAME(s) Lindsay Daly, Kaylee Clark, Lillian Meunier

PROJECT NUMBER GP10

SCHOOL Missisquoi Valley Union High School

GRADE 10

TEACHER Maria D. Dezotell

PROJECT TITLE **Saponification of By-Product Glycerol Formed in Production of Biodiesel from Recycled Cook**

ABSTRACT

By-product glycerol from biodiesel production was converted into soap by saponification. Preliminary research determined that glycerol is found in many cleaning products and a recipe using sodium hydroxide for solid soap and potassium hydroxide for liquid soap was a promising starting point. The hypothesis was that the source of recycled oil would influence the efficient process of soap formation. The team used stoichiometry, scientific reasoning, Le ChatelierÆs principle, and other observations to design and conduct a series of experiments to evaluate the process and product. A distillation station removed any excess methanol from the glycerol. The quantities of glycerol and base were the independent variables, while the time to reach the boiling point, simmer time, and pH were the dependent variables. The team measured the densities of glycerol from three sources: McDonaldÆs cooking oil, peanut oil and the laboratory grade glycerol. The findings were consistent with the colligative properties of density and compared favorably with laboratory grade glycerol-produced soaps. After eleven trials, a neutral pH solid soap was manufactured and it was confirmed that the base was the limiting reagent. By allowing a longer simmer time, the solidification time was reduced from three weeks to one day. The glycerol derived from peanut oil was a more successful soap ingredient because it was clearer, had a uniform consistency, solidified faster than cooking oil from McDonaldÆs, and cleaned glassware with adequate suds. The soap proved to be complimentary to the original biodiesel recipe by turning its waste into an environmentally friendly, organic product. The hypothesis was confirmed: the source of glycerol production definitely influenced the saponification chemistry.

NAME(s) Sofia Dattilio
PROJECT NUMBER C05
SCHOOL Hinesburg Community School
GRADE 7
TEACHER Stephanie Konowitz

PROJECT TITLE **I'm in Hot Water**

ABSTRACT

Heat from burning wood can help you boil water. I wanted to know which type of wood boiled water faster. Many people say that they need the best type of wood to burn in a wood stove, so I wanted to see which one would be the best for my own knowledge. I learned that maple has the lowest density than hickory, and willow. MapleÆs density is 39-47 lb per cubic foot. I first started out making sure there was a good fire going, then once there was, I put the timer and the 250 mL of water on at the same time. I then waited until it started to boil, and recorded it. Maple makes water boil the fastest, willow in the middle and it took hickory the longest. Maple burned the fastest but doesnÆt have the highest density.

NAME(s) Nevil Desai
PROJECT NUMBER G06
SCHOOL South Burlington High School
GRADE 9
TEACHER Curtis Belton

PROJECT TITLE **Bioremediation using Pseudomonas Aeruginosa on Oil's**

ABSTRACT

○Throughout the year, thousands of gallons of oil are dumped into ecosystems; damaging habitats and wildlife that once thrived. Governments have funded organizations to clean up the disaster but the equipment is very expensive and extremely laborious. This problem needs to be solved in a more efficient and inexpensive approach. Bioremediation, the branch of biotechnology that uses biological process to overcome environmental problems (Princeton.edu). By using a bacteria, Pseudomonas Aeruginosa, this microbe is able to decay the hydrocarbons into its pores, sinking to the bottom after decomposing the oil. This economical resource gives scientists the ability to stop the rapid spread of oil in the water that will adversely affect wildlife. Environmentally, it is found in seawater; not altering the normal habitat of the water.

○In the experiment, an outstanding results from the Pseudomonas Aeruginosa will be seen because the control (consisting water and oil) will only solidify the oil, not decreasing the amount; the organisms will reduce the total quantity of oil. I hypothesize that the Pseudomonas Aeruginosa in the test tubes will decrease the amount of oil substantially, versus the control making the oil more soluble and separating the 2 substances by their density.

○

○Bioremediation is an effective alternative to decreasing the absurd amount of oil discharged into ecosystems. It is economically efficient but so natural that it will not alter the habitat of sea life. This operational substitute that can decrease the amount of wildlife deaths can substantially help local economies that require the environment to support businesses. Saving time and money of large corporations, this effective resource will help the disaster effort after a devastating oil spill

NAME(s) TrΘ Diemer
PROJECT NUMBER B08
SCHOOL Mater Christi School
GRADE 6
TEACHER Mark Pendergrass

PROJECT TITLE **How clean are your hands- REALLY?**

ABSTRACT

This fascinating science fair project called ôHow Clean Are Your Hands, Really?ö was designed to help understand hand washing times and determine which washing time abolishes the most germs. This test investigated how longer washing times will effect amount of germs on hands and if the current suggested hand washing time (20 Seconds) should be increased or decreased. The hypothesis was that if you washed your hand for a longer time a reduced amount of germs would be present. Background research discovered an average suggested washing time of 20-30 seconds. All of the participants signed a waiver stating there was a small risk of minor skin irritation in the test. During testing participants would wash their hands for 0, 5, 10, 15, 20, 40, or 60 seconds depending on what is asked of them. At the beginning of the test the participant would rub on Glo Germ lotion. The product shows artificial germs under an ultraviolet light. They would wash the artificial germs off their hand. A picture would be taken using an IPod and the process would be repeated for the different hand washing times. When collecting data a chart was created with a hand broken up into 100 pieces. Each square represented one percent of the entire hand. The image from the IPod was then copied onto the chart. Squares that were partially filled were broken into 0.1%. The squares were then added together to make a percentage. The concluding data explained that washing hands longer does indeed leave fewer germs on the hand. Washing your hands a suggested 20 seconds leaves your hand approximately 21.42% dirty. When washing hands the longest tested time, 60 seconds, 2.83% of the hand is dirty. Therefore, washing your hands for a longer time ensures fewer germs, proving the hypothesis correct.

NAME(s) Elissa Doering
PROJECT NUMBER G07
SCHOOL The Randolph Homeschool
GRADE 7
TEACHER Gina Sweet

PROJECT TITLE **The Impacts of Different Plant Fertilizer**

ABSTRACT

Farming is crucial to the sustainability of Vermont Communities, and the economic health of our state. Growing plants successfully within the relatively short growing season in Vermont often requires the addition of added nutrients in the form of fertilizers. I wanted to compare the impacts of organic and man-made chemical fertilizers on the environment, specifically focusing on potential surface and groundwater impacts.

I hypothesized that the organic fertilizer would have less excess-nutrient runoff than the chemical fertilizer. I expected these results because I believe that organic fertilizer would integrate better within the immediate soil and the roots of the young plants, while I anticipated that the chemical based fertilizer, due to its solubility, could more easily end up in excess runoff.

To explore this question, I did a series of procedures. I built a nursery, crafted out of a medium sized cardboard box, lined with tinfoil, and lit with an LED lamp. After preparing the soils with fertilizers according to the recommended dosages, I planted the seeds. Following specifically pre-determined intervals of watering and simple observations, I tested the soil for Nitrogen, Phosphorus, Potassium, and pH, using a standard soil test kit.

My results generally confirmed my hypothesis. Specifically I found excess Potassium and close to excess Nitrogen leaching from the chemically fertilized pots. As expected, the organic cups did not produce excess nutrients. To my surprise, however, in my control samples I found a surplus of nitrogen, even though no fertilizer had been added.

In conclusion, water runoff can carry excess nutrients, due to the application of chemical fertilizers. Organically based soil, due to lower concentrations of nutrients, yields less nutrients, and is therefore safer to the environment. I would recommend, that this experiment be repeated outside in larger test plots to increase the accuracy of these results.

NAME(s) **Lexie Drew, Theresa Noonan**

PROJECT NUMBER **GP09**

SCHOOL Main Street Middle School

GRADE **8**

TEACHER Amy Kimball

PROJECT TITLE **Got Pain? Get The Fastest Relief**

ABSTRACT

Pain relievers come in many different forms. These forms include tablets, caplets, gel caps and liqui-gels. The form of pill affects the dissolution time. This experiment tested which form of pain reliever dissolved the fastest in simulated stomach acid. Our prediction was that if the simulated stomach acid had an affect on the pain reliever forms, than the liqui-gels will have the fastest dissolution time. This is because there is only one layer surrounding the liquid. After we heated up the simulated stomach acid we put one of each form of pill, then recorded our results. We repeated this three times for each form. The CVS Tablets dissolved the fastest with an average time of 42 seconds. The CVS Liqui-Gels dissolved the slowest at an average of 11 minutes and 7 seconds. Therefore the CVS Tables dissolved more than 10 minutes faster giving you the fastest relief.

NAME(s) **Catherine Dune, Danielle Petrie, Jazmine Franks**

PROJECT NUMBER **GP22**

SCHOOL Barre Town Middle School

GRADE **8**

TEACHER Jennifer Aither

PROJECT TITLE **Aromatherapy**

ABSTRACT

This is an exploration of how different scents, in the form of candles, can impact a person's moods and emotions.

NAME(s) **Natalie Dunn, Yvonne Otis**

PROJECT NUMBER **GP14**

SCHOOL Barre Town Middle School

GRADE 8

TEACHER Jennifer Aither

PROJECT TITLE **Water Hardness**

ABSTRACT

This project is an exploration of water hardness and how it impacts households. We explored water samples from our area and compared them to the state overall.

NAME(s) **Connor Durochia**

PROJECT NUMBER **S07**

SCHOOL Hinesburg Community School

GRADE 7

TEACHER Stephanie Konowitz

PROJECT TITLE **Spooky Sounds!**

ABSTRACT

Most peopleÆs heart rate increase after watching a scary video. But will this change if you disable the sound? I created this experiment to see if having sound, or no sound, in a scary video will increase your heart rate. The outcome might explain why many kids are afraid of scary videos that have loud noises. I love scary videos because I like the thrill of being scared. I wonder if I can increase the sound, on a scary video, to increase my heart rate making me more scared. Scientists say that sudden and loud noises increase your heart rate. I made a scary video to test students from 7th and 8th grade with. I took 1 student from 7th and 8th grade and had them watch the scary video with sound. I recorded the studentÆs heart rate before and after the video. I did this 11 more times and then did the same thing but had 12 kids watch the video without sound. In the end having sound in the scary video made studentÆs heart rate increase more than having no sound in the video. This would explain why some people turn down the volume of a scary video when something scary is about to happen.

NAME(s) Siobhan Eagan, Olivia Rooney
PROJECT NUMBER GP08
SCHOOL St. Mary's School
GRADE 5
TEACHER Mr. Hill

PROJECT TITLE **What's in Your H2O?**

ABSTRACT

We wanted to know how much and what kinds of bacteria are in water that we use daily. We did this experiment because we wanted to make sure that the water we play in or drink is safe.This project is important because it can help everyone be more cautious about the hazards that may be in the water we are using. Our hypothesis was that some water samples will have more bacteria than others. We collected and tested bottled water, tap water, toilet water, melted snow, shallow and deep well water, sulfur water and water from Otter Creek. We filtered 500ml of water from each sample through a o.45u filter. Bacteria trapped on the filter were placed on a nutrient agar plate so that the bacteria, if present, could grow. After 24 hours at 37 degrees C we observed many bacterial colonies. We used a loop to transfer the colonies to a glass slide so we could observe them under the microscope. Our results showed that the tap and bottled water had the least number of bacteria, and that deep well, Otter Creek, sulfur and toilet water had the greatest number of bacteria. Some bacteria were shaped like spheres or rods arranged in tetrads or chains. Our observations allowed us to accept the hypothesis that some water samples have more bacteria than others. Based on what we observed, we suspect that some water sources are safer than others. For example, untreated water from Otter Creek probably isn't very safe to drink or swim in.

NAME(s) Elijah Eaton, Taylor Marquis, Kraig McFadden
PROJECT NUMBER GP19
SCHOOL Missisquoi Valley Union High School
GRADE 11
TEACHER Maria D. Dezotell

PROJECT TITLE **Producing Biodiesel by Heatless Transesterification of Recycled Cooking Oil**

ABSTRACT

The purpose of this project was to implement the creation and use of biodiesel from recycled oils at school to save money and protect the environment. Our team hypothesized that by altering the catalyst used in the traditional biodiesel recipe, we could create a fuel without need for additional heat. This would make the manufacturing process faster, cheaper, and better for the environment. Multiple types of cooking oil were tested using sodium hydroxide or potassium hydroxide as catalysts. Methanol and the catalyst of choice were mixed together to form methoxide, which was then mixed into the oil. This caused esters in the oil to separate so they could be siphoned off. The resulting ester-free oil was biodiesel and could be used in any diesel engine. Burn tests were conducted to see which fuel worked the best. Finally, titrations were performed on various oils to find the optimal amount of catalyst to use. The source of recycled oil and temperature were the independent variables and the resulting mole ratio of catalyst was the dependent variable. A longer burn time and neutral pH indicated a higher-quality fuel. Potassium hydroxide and peanut oil were the best combination with a burn time of thirty-six seconds per square inch and a pH of seven. The exothermic reaction created by mixing the methoxide provided enough activation energy to create the biodiesel successfully, thereby eliminating the need for additional energy. Plans for the fuel included powering tractors at the school, saving money compared to regular diesel and producing less greenhouse gas emissions.

NAME(s) **Sarah Eustis** PROJECT NUMBER **C06**

SCHOOL Saint Francis Xavier GRADE 8

TEACHER Mary Ellen Varhue

PROJECT TITLE **Salty Sells**

ABSTRACT

○My project investigated why our fingers wrinkle when in water for a while. I chose this project because I am interested in osmosis and have always wondered why our fingers wrinkle. My hypothesis is: if there is more salt in the dialysis tubing cells then the cell will gain more water after twenty minutes.

For my procedure I soaked dialysis tubing and then made cells out of it with different salt solutions in each one. Each cell had a beaker to go into. I had a one percent cell in a beaker of one percent solution, a ten percent cell in a one percent beaker, a ten percent cell in a fifty percent beaker, and a fifty percent cell in a one percent beaker. I weighed each cell and then put them each in their beaker. I waited twenty minutes and then weighed them again, finding their differences in weight.

○My results showed that the more salt in the cell makes the cell gain more weight. The one percent cell stayed the same, the ten percent cell in one percent beaker gained an average of 0.4 grams, the ten percent cell in fifty percent beaker lost an average of 0.6 grams, and the fifty percent cell in one percent beaker gained an average of 1.3 grams.

From my experiment I concluded that my hypothesis was correct. The cells gained or lost water because of osmosis which caused water to move through the semipermeable membrane from lower to higher salt concentration. In real life, we would be the higher percent of salt solution so our cells do swell in water, but only some of our cells do. The cells that make up our fingerprints do not swell but the cells around them do; this creates a wrinkle effect.

NAME(s) **Erynn Ferraro** PROJECT NUMBER **B43**

SCHOOL Mater Christi School GRADE 7

TEACHER Mark Pendergrass

PROJECT TITLE **Giddy Up**

ABSTRACT

Abstract :

The science fair project titled "Giddy Up" was conducted to answer the question: What color feed bucket does this horse prefer? It was hypthesized that if one were to put three different color feed buckets in front of a horse, then he/she would go to the most common color he/she sees every day (In this case: green for grass). The research indicated that all horses must eat at least three times daily. When further research was conducted, it said that this was due to horse's having a small stomach for their body size. The procedure involved sorting three scoops of the same amount of grain into three different colored buckets. Before the procedure was tested, the horse was tied up to keep him still. After the experiment was set up, the horse would be untied. The horse eventually would choose a bucket to eat from. That color would then be recorded into a data table. The color that the horse went to the most would be considered his/her color preference. One thing that affected the data collection process was attemtpting to keep the horse still. Putting down the three buckets was a challenge with a hungry horse. The horse would charge for the first bucket that was placed down. Although that effected the data collection, most trials were done with the horse tied up. Results also showed that the hypothesis was correct. Out of the three colored buckets the horse chose the green bucket ten out of nineteen trials.

NAME(s) Olivia Ferraro
PROJECT NUMBER B44
SCHOOL Mater Christi School
GRADE 7
TEACHER Mark Pendergrass

PROJECT TITLE **Bird Bon Appetit**

ABSTRACT

This project was intended to answer the question: Do birds prefer one type of seed more than others? It was hypothesized that if birds are given a choice of seed, then they will eat more of a specific type. When background research was conducted, a lot was learned about birds in North America; what they eat, look like, migration patterns, and typical wintering behaviors. Additional research was done to gain more knowledge about birds that might visit Northern Vermont in winter. In the procedure for this project a bird feeder was put outside with three different types of seeds in it. The height of seed was measured with a ruler before it was put outside. The feeder was left out for two or three days at a time before being taken in for a measurement. The seeds height was measured in inches. The remaining seed was subtracted from the height in the beginning resulting in how much seed the birds ate. The feeder was refilled and put back out. For the data collection process measurements were taken of each seed height after two to three days. It was important for this project to measure the seed level accurately and complete the math correctly. The hypothesis for this experiment was correct. The data showed that the birds preferred black oil sunflower seeds more than the other kinds of seed provided.

NAME(s) William Fretwell
PROJECT NUMBER B09
SCHOOL South Burlington High School
GRADE 9
TEACHER Curtis Belton

PROJECT TITLE **What is the most efficient culture for anaerobic digestion?**

ABSTRACT

The purpose of this experiment was to figure out what effects kitchen food waste, leaves, newspaper, and sawdust had on biogas production when mixed with cow manure in anaerobic digestion. In conducting this experiment, itÆs hypothesized that the control of cow manure will produce the best results of gas production, as this alone is commonly used on farms to produce electricity.

The control group in this experiment is the culture of cow manure, while the experimental groups are the mixtures of cow manure with: kitchen food waste, leaves, newspaper, or sawdust. The dependent variable is the amount of methane (major gas from biogas that produces heat) that will be produced in mL, while the independent variable is whatever substrate is being added to the cow manure.

Data collection is currently incomplete, but itÆs expected that the culture of cow manure alone will produce the best results. The data will initially be analyzed day by day from about 7 to 10 days, depending on however long it takes for the biogas to fill the bottle back up, where observations will be taken day by day on biogas production, appearance of the culture, and appearance of the bottle. Pictures will be taken with a camera day by day for all the bottles for reference. Once the gas has built up, I will figure out how much methane was created for each bottle.

Anaerobic digestion is an alternative, cheap effective way of creating energy; that is becoming an emerging topic of interest.

NAME(s) **Karim Fuad**

PROJECT NUMBER **S08**

SCHOOL South Burlington High School

GRADE **10**

TEACHER Curtis Belton

PROJECT TITLE **Subliminal Messages**

ABSTRACT

The purpose of this experiment was to see the effectiveness of subliminal messages and also being able to identify whether they are more effective of the male or female population. In some countries subliminal messages are thought to be powerful, in some cases too powerful to be legal; Russia.

Two compact identical compact discs have been produced, only difference is that one has had a subliminal message embedded into it (ôChoose Redö), while the other remains untouched. 50% of each gender population will listen to one compact disc, whilst the remaining 50% will listen to the other. The control group in this experiment consists of high school students, both male and female, who are not exposed to the compact disc holding the subliminal message. The dependent variable consists of high school students, both male and female, that are exposed to the compact disc holding the subliminal message. Upon completion of the compact disc, students are to choose one colored M&M, from the bowl of M&Ms.

Data collection is incomplete at the moment, but it is assumed that subliminal messages do not work so there will be no correlation between the number of people exposed to the subliminal message and the number of people who selected a red M&M.

NAME(s) **Katherine Fusco**

PROJECT NUMBER **C07**

SCHOOL Rutland High School

GRADE **11**

TEACHER Ann Marie Mahar

PROJECT TITLE **What Affects The Rate of Drug Solubility?**

ABSTRACT

The purpose of this experiment was to find which general pain reliever dissolves the fastest in the stomach and therefore enters the bloodstream quickest. To find this, I used Uncoated Tablets, Coated Gels, and Extra Strength Tablets. I placed a pill in varying levels of acidity heated to 37 degrees Celsius and timed them until only the powder was left in the liquid, I did this three times for every pill in every different liquid. The liquids I used were Sprite (pH 3), Vinegar (pH 2.5), Water (pH 7), and Lemon Juice (pH 2, this is closest to the stomach). I concluded that Extra Strength tablets dissolved the quickest, with Uncoated Tablets and Coated Gels coming in 2nd and 3rd, respectively. Some possible research applications that this data could go toward are Pharmaceutical companies realizing the need for a more effective coated pill. Coated Pills are important to families with small children because they allow for relief that liquid medication would take longer to give them. The coating on a pill shouldnÆt take so long to dissolve, which can be accomplished by a lighter coating made out of a different substance.

NAME(s) **Maddie Gallagher-Strauss** PROJECT NUMBER **C08**

SCHOOL Fredrick H. Tuttle Middle School GRADE 7

TEACHER Chris Towle

PROJECT TITLE **Dough On Ice**

ABSTRACT

The problem studied was if freezing instead of refrigerating cookies will affect their taste. The hypothesis was that the frozen cookies will taste like metal as if they had been frostbitten. The procedures consisted of steps from making the cookies to having people test the cookies. Out of 15 people, nine people thought that the refrigerated cookie was better; three people thought that the frozen cookie was better, and three people thought that the two cookies tasted the same. One thing that all the people who tested the cookies said was that the frozen cookie was a lot moister. In conclusion, the frozen cookie didnÆt taste metal but it was a lot moister than the refrigerated ones. More people seemed to like the refrigerated cookies better than the frozen ones.

NAME(s) **Katrina Garrow** PROJECT NUMBER **C09**

SCHOOL Saint Francis Xavier GRADE 7

TEACHER Mary Ellen Varhue

PROJECT TITLE **Bye Bye Eggs**

ABSTRACT

○Proteins are an essential part of our daily diet and the work of enzymes is crucial to breaking proteins apart so our bodies can use them. I investigated how temperature affects the ability of enzymes to disintegrate an egg using the enzymes available in Tide detergent.

○My hypothesis was ôIf the temperature increased, then the egg weight will decreaseö. I went to the store to find a detergent that said enzymes were in it. Surprisingly I didnÆt find very many. Tide detergent was one of the only detergents that said it had enzymes in it. I took 3 pairs of jars. One jar had 1 tbsp. of Tide in it and the other jar had plain water. I kept one pair of jars in the refrigerator, one pair at room temperature, and the last pair over the heater. I weighed the eggs at the beginning of my testing and then each day. It took 4 days for the jar with Tide on the heater to be completely gone. But I added a 5th day to see how much the others would decrease. The room temperature jars decreased a little more but not much. The cold jars barely did anything at all. The jars with water in them did completely nothing.

○In conclusion I proved my hypothesis. The enzymes in Tide worked much better at higher temperatures. Eggs without any enzymes did not disintegrate.

NAME(s) Alec Gelfenbein

PROJECT NUMBER G08

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **The Effect of Wetlands on Water Pollutants**

ABSTRACT

The purpose of this experiment was to determine the effect of wetlands on pollutant levels in water. It is hypothesized that the wetlands will filter out pollutants at a higher rate than soil.

The control group in this experiment was a system in which a pump circulated three gallons of water polluted with nitrogen and phosphorous through local soil. The dependent variables were the levels of nitrogen and phosphorous present in the water. The levels of these pollutants were measured before the experiment and each day. The experimental group was the same as the control but there were wetland plants in the soil.

Data collection has not yet been completed but based off of the results so far wetlands will filter nitrogen and phosphorous out of the water faster than the soil. Also, it appears that nitrogen is being filtered out of the wetland at a higher rate than phosphorous. The data will be analyzed to find any changes in pollutant levels, the rate of change, and any human or instrument error that could have occurred. Also, Analysis will include how adding wetlands to our community could be beneficial, the cost of doing so, and its potential effectiveness.

NAME(s) Evan Geremia

PROJECT NUMBER G09

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Demonstration of renewable energy production using household food waste.**

ABSTRACT

This lab is designed to discover important things about energy production. Due to the fact that gas and oil are limited and hurting the environment, it is necessary to find something to fit its place. To achieve this goal some new and innovative things need to develop and one of these could be self-run bio-digesters. The end result of this lab will hopefully tell more about home energy production in the future.

- An inoculum (anaerobic micro-bacteria) takes a feedstock (manure) and turns it into methane. My experiment will test the ability of a household inoculum to match up to a proven and trusted one (AvatarÆs). The positive and negative controls will be two digesters of Avatar inoculum and two with no inoculum. The experimental will be two tests of my inoculum.
- The first step was to make the inoculum that will compare to the trusted inoculum. It is currently under development but is created by taking household food waste and compacting it into a container to make anaerobic microbes. The second step is to build and test. The digesters are a vile that is connected to a water trap. The digester contains the inoculum and manure that produce gas. The gas then travels to the trap where it displaces water to be measured.
- Data is still being collected at this moment but testing of the inoculum should begin shortly. Afterwards, the data will be evaluated based on whether or not the homemade inoculum produced more methane than the trusted one.

NAME(s) **Joey Geremia** PROJECT NUMBER **P11**

SCHOOL Frederick Tuttle Middle School GRADE 7

TEACHER Chris Towle

PROJECT TITLE **Battery Life**

ABSTRACT

The first battery was created by Alessandro Volta, an Italian physicist who was a pioneer in electricity. In the 1800's he created a voltaic pipe which was a battery that produced a stream of electricity. With this creation the electrical unit the volt was named after him. His invention helps everyone that uses the battery to power their things today. The battery is actually an electric cell; it is a device that uses electricity from a chemical reaction. A voltage pile is created by layering zinc, brine soak, or cloth, and silver on top of each other. This reaction was the first working battery created by Alessandro Volta. There are many battery brands today but which type of battery is truly the longest lasting? This report can help anyone who wants to buy batteries and truly have the longest lasting one to save money and materials.
This test is to see if different types of batteries have different battery life. It was hypothesized that the batteries will go out at very different times and not at the same time, because different battery companies promise different battery life time. For this experiment batteries were placed in a flash light and it was turned on. At the same time, a timer was turned on. Once the battery ran out the timer stopped and the data was recorded. Multiple trials were done for different batteries. The major findings were that the batteries Duracell, Rayovac and Energizer all had different battery life. Duracell was the longest lasting, than Rayovac and Energizer came last. In conclusion the Duracell battery had the longest life of the others and for that reason the Duracell battery is the longest lasting out of these three types.

Works Cited

Bellis, Mary. "Battery." About.com Inventors. About.com, 2013. Web. 10 Feb. 2013. <http://inventors.about.com/od/bstartinventions/a/History-Of-The-Battery.htm>.

NAME(s) **Kayla Gilding** PROJECT NUMBER **G10**

SCHOOL South Burlington High School GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **How Phosphorus in Lawn Fertilizer Affects Lake Water**

ABSTRACT

The purpose of this experiment is to determine whether or not lake water treated with phosphorous-containing lawn fertilizer will emit higher levels of algae growth, identified by measuring phosphorous levels, and the turbidity of the water. The overall quality of the lake water will be assessed by comparing a sample treated with fertilizer containing phosphorous, with fertilizer containing only nitrogen and potassium and no phosphorous. The results of the lake water experiment will be compared to an identical study, substituting demineralized tap water for the lake water.

The control group in this experiment is represented by a container containing tap water with algae supplemented, as well as lake water containing algae already. Both containers will be treated with an N-K fertilizer, or one without phosphorous. This studyÆs experimental group will contain again two containers, one filled with an equivalent amount of tap water, and another filled with lake water, both containing algae, but instead, they will both be treated with phosphorous-containing lawn fertilizer respectively, the independent variable. Daily analysis of both phosphorous levels and turbidity will be taken, acting as the dependent variable.

Although complete results have not been obtained, it is hypothesized that lake water treated with the phosphorous will have the highest phosphorous level, and turbidity, allowing for the greatest amount of algae growth and overall poorest quality of water.

This experiment will serve as an evaluation of the effectiveness of VermontÆs recent phosphorous laws which regulate fertilizers to protect the overall quality and health of lakes.

NAME(s) Grady Gilman, Andrew Wood
PROJECT NUMBER GP18
SCHOOL Windsor Jr/Sr High School
GRADE 8
TEACHER Jennifer Townsend

PROJECT TITLE **Parachute Madness**

ABSTRACT

What type of parachute will be the most safe? Is the common jellyfish like parachute the most safe, or is the new, rectangular shaped parachute the most safe, or is there an undiscovered, new type of safe parachute?
Parachutes are the only item used to get from up in the air to the ground, safely and accurately, making them very important to many people, including my grandfather who was a smoke jumper in Alaska. The first commonly used parachute was the mushroom like parachute mostly used in the 1960Æs. Nowadays the rectangular shaped parachutes are used to drop down from the air. So my partner and I made up a hypothesis that the mushroom shaped parachute would be the most safe. Our choice of material for this project was a light garbage bag, weighting practical nothing. We cut a rectangular shaped piece, a circular piece, and a star shaped piece, all out of the same bag and roughly the same shape. We then added 4 pieces of string to the cut out shapes and added our weights My partner and I then found a nice place to drop our parachutes inside a building, and dropped all of the parachutes onto a target. From the data we collected, we concluded that the rectangular shaped parachute was the most safe because it had the most safe descend out of all the parachutes, meaning the slowest drop rate, and the second best accuracy.

NAME(s) Aiman Ginawi
PROJECT NUMBER G11
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Bioremediation of Oil Spills in Aquatic Environments**

ABSTRACT

The purpose of this project is to test if natural nutrients and elements will either help or not help the natural microbe population in sea water in an environment, which was just effected by an oil spill, speed up bioremediation. Bioremediation is the process in which harmless microbes in sea water eat up all the harmful wastes in an aquatic environment and release them as harmless waste. These nutrients are food to the microbe population, and with more food the microbes will probably grow faster and faster to optimize bioremediation. NPK fertilizer, which is filled with important nutrients like nitrogen, phosphorus, and potassium, will be the food for the microbes to eat and hopefully allow the population to grow. Seawater, filled with microbes, will also be used in the experiment. The oil that will be used to create the ideal oil spill in the experiment is motor oil. Eight test tubes will be used in the experiment using the materials above except for 2 controls which will only contain sea water and motor oil. Four test tubes will be put in an area of high temperature and the other four test tubes will be put in an area of low temperature. In this experiment there will be two independent variables. The first will be the amount of nutrients put into the test tube and the second will be the temperature of the room.

NAME(s) **Jeffrey Giroux** PROJECT NUMBER **C10**

SCHOOL Hinesburg Community School GRADE **8**

TEACHER Stephanie Konowitz

PROJECT TITLE **Carbon Conundrum**

ABSTRACT

I read an article that speculated on why certain water species suddenly went extinct. One of the theories was that there was a higher level of Carbon Dioxide in the atmosphere, and the pH of the ocean water lowered, which made it no longer suitable for those species. This experiment was designed to test if Carbon Dioxide had the ability to dramatically change the pH level of water in different environments. The outcome will determine if those water species could have gone extinct due to the rise in Carbon Dioxide. Alka Seltzer was added to isolated containers within larger containers filled with water, and the reaction with the water created Carbon Dioxide. I measured the pH level of the water in the outermost containers throughout the experiment, and the container remained closed for multiple hours after the reactions so the Carbon Dioxide could interact with the water. I repeated the experiments multiple times with different starting pH levels, to see how the Carbon Dioxide changed its effects. The results of my experiments showed that the pH levels of the containers without Carbon Dioxide stayed close to the original level, while the containers with Carbon Dioxide added had a dramatic change. From this I concluded that Carbon Dioxide could have been the cause for the water speciesÆ extinction.

NAME(s) **Madison Gorrigan** PROJECT NUMBER **C11**

SCHOOL Saint Francis Xavier GRADE **7**

TEACHER Mary Ellen Varhue

PROJECT TITLE **What a Relief**

ABSTRACT

○For my science fair project I tested which antacid worked best for heartburn. What I found in my background research was that heartburn happens when acid comes into the esophagus from the stomach, and causes a burning pain. Antacids are commonly used to stop heartburn. My hypothesis was that I thought the Tagment and the Tums were going to work the best.

I used vinegar to model the acid in a stomach. I used a mortar and pestle to grind up solid medications. I added prescription doses of each antacid to the vinegar and tested the pH of the mixture with pH paper after adding the medication to measure how much of the acid had been neutralized.

○My results disproved my hypothesis. Baking soda and Phillips Milk of Magnesia did the best. Two medications had no effect: Tagment and Pepcid AC. After investigating I discovered that these medications work by lowering the acid in your stomach before you eat so my test is inconclusive about these.

NAME(s) Gia Gould

PROJECT NUMBER S09

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Impact of Perceived Intelligence on Male Attraction**

ABSTRACT

The purpose of this experiment was to determine whether perceived female intelligence affects malesÆ attraction to females. In a study done at Columbia University, researchers concluded that increased education enhances a womanÆs overall attractiveness, to the extent that educational successes can compensate for physical imperfections. In conducting my experiment, it is hypothesized that college age men will find women with higher perceived intelligence to be more attractive. The control group in this experiment consisted of 50 college aged men shown ten head shots of college aged women. One set of photos will include fabricated GPA, SAT scores and chosen college. Participants will be asked to simply rank the photos from 1-10 in attractiveness. One set of photos will have no data while the second set will include the fabricated data. Photo rankings per participant will be evaluated for increase or decrease in rank per participant. Differences in ranking and choice will be noted.

Data collection is not yet complete, but it is expected that similar to the Columbia outcomes, college men will find women with signs of higher intelligence to be more attractive, possibly changing the ranks due to this additional information, thereby confirming that perceived intelligence is an æadded valueÆ asset for women when being selected as a mate.

The hypothesis, that academic markers of success will effect perceived attractiveness in partner attraction.

NAME(s) Danny Greenblatt

PROJECT NUMBER B10

SCHOOL South Burlington High School

GRADE 10

TEACHER Belton

PROJECT TITLE **Freezing and Thawing Microorganisms**

ABSTRACT

The purpose of this experiment is to determine the effects not just of freezing, but of the speed of thawing. Many people have done experiments on the freezing of microorganisms, but few have experimented with the effects of the thawing process itself, let alone its speed. The hypothesis is that the fester speed of thawing will cause more damage to the microorganisms than a slower speed.

○The control in this experiment is two cultures of bacteria frozen at -10 Celsius and then thawed at room temperature. The other cultures will also be frozen at -10 Celsius, but will then be put in environments with different temperatures, not enough to kill or freeze the microorganisms, to change the speed of thawing. The independent variable is the temperatures the cultures will be placed in to thaw, and the dependent variable is the speed of the bacteriaÆsÆ thawing. After the bacteria have thawed, the number of living bacteria in each culture will be tested.

○Data collection has not yet started, but it is expected that the increased speed of thawing will exacerbate any shock normally experienced by the bacteria during thawing, increasing the damage, while slower thawing will allow the bacteria to adjust to the changing temperature more easily, and more will survive.

○This experiment could show whether, from a standpoint of killing bacteria, the speed with which you thaw food makes a difference.

NAME(s) James Gregoire

PROJECT NUMBER B11

SCHOOL South Burlington High SChool

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE

ABSTRACT

The purpose of this experiment is to determine the ideal conditions in which bread mold grows. The molding of bread is often a problem, but under the right conditions the rate at which the mold grows can be significantly lessened. It is hypothesized that mold grows best in bread with lower preservative content, in warmer and wetter areas.

The controls for this experiment are the pieces of bread kept at room temperature. The dependent variables include heat (room temperature vs. refrigerated vs. frozen), wetness (soaking in water vs. dry), and amount of preservatives (store-bought white with preservatives vs. homemade without preservatives).

Two pieces of bread, one store-bought white and one homemade, will be placed in each kind of condition. The bread will be organized according to how much mold was grown after a three week period in which the mold can grow. For the first few days all of the bread slices will be photographed to see how long it actually takes for bread to mold, and more pictures will be taken over the 3 week period.

Finding out more about the ideal conditions of mold growth will teach us the conditions we can keep bread without it molding. For example, if less mold grows in colder areas, as is hypothesized, it is obvious that keeping bread in colder areas will lead to a longer time in which the bread can be eaten.

NAME(s) Logan Hall-Potvin

PROJECT NUMBER B12

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Bacteria on Floors - The Different Harms**

ABSTRACT

The purpose of this lab was to identify what way of cleaning floors is best for preventing the spread of the most dangerous bacteriaàDisinfectant wipes or vacuuming. Due to the fact that data has not been collected yet, I believe that the more efficient way of cleaning floors will be with disinfectant wipes, because they kill bacteria as well as remove visible dustàtherefor preventing the spread of more bacteria.

In order to obtain sufficient results, there will need to be three sets of different testing environments, each having their own three separate taped off zones, two experimental and a controlled. The two experimental groups have different ways of cleaning methods, with wipes and vacuuming, and the control is not cleaned at all. Each testing environment is determined by how trafficked it isàlow, medium or high. The low trafficked area is located under a bed, the medium trafficked area is located in a hallway, and the high trafficked area is located on a flight of stairs. Once a week, a swab of the floor will be taken to a research center for the bacteria to be identified, and therefor to show how dangerous that particular bacterium is.

As stated earlier, data has not been collected, but I hypothesize that disinfectant wipes will be the best way to clean, because they will remove visible dust and kill bacteria. This will impact the bacteria around it from spreading as well.

NAME(s) Julia Halvorson-Phelan
PROJECT NUMBER G12
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Effects of Acid Precipitation on Environment**

ABSTRACT

The purpose of this experiment was to determine the effects of acid precipitation on the environment. With lemon juice acting as faux acid, the experimental plants will be watered with water mixed with lemon juice. The control plants will only be watered with normal tap water. It is hypothesized in this experiment that the experimental plants will either grow much slower, not grow at all, or die much sooner.

There are 20 of each experimental and control radish plants, with a total of 40 radish plants. All were planted on the same day in the same conditions. Every plant was watered with about 30 ml of water and the experimental plants watered with water containing lemon juice. At the end of the experiment, the pH level of every plant will be tested. Whatever radishes are in existence will be weighed as well as measured in circumference. At the end, graphs will be made to show the comparison between the control and experimental plants.

The experiment began on March 1. The data so far has shown a much slower growth rate, the dying of plants, and hardly any growth at all with the experimental plants. The experimental plants have shown loss of water much faster than the control. The control plants have all appeared to thrive, showing a healthy green color and great height. Acid precipitation has created problems with the forests all over the world. This experiment will show what problems actually exist due to the acid precipitation.

NAME(s) Caitlin Hanley
PROJECT NUMBER B31
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **Digestion's Impact On Green House Gases**

ABSTRACT

The purpose of my project was to recreate the three different types of digestion and calculate their impact on green house gases. In order to do this, I used three different procedures, one for anaerobic, one for manmade aerobic, and one for aerobic (compost). Anaerobic digestion requires no oxygen, so I put pond waste, food waste and horse manure in an airtight jug and attached a plastic tube in it with a Ziploc bag on the end to catch the methane. Manmade aerobic digestion needed food waste and microbes, so I put both of the products into a container, put the lid on and shook it frequently. Composting needed food waste, yard waste and horse manure, so I put all of that into a container and let it sit for weeks to breakdown. In the end, I determined that manmade anaerobic digestion took the least amount of time (about 2 days) to create a usable byproduct and had the smallest impact on green house gases, with a total of 0.00036 mgCO2e/ton. This proved my hypothesis partially correct because it took a lot less time to create a usable byproduct. Many things could be researched based off of this project, like the impact on the environment due to transportation, landfill quality and maintenance even possible steps that we as a community can take in our own landfill to help decrease its impact.

NAME(s) **Ashley Heaney**

PROJECT NUMBER **B13**

SCHOOL Northfield Middle High School

GRADE 11

TEACHER Cynthia Tomczyk

PROJECT TITLE **The Effect of Different Temperatures on the Growth of Bacterial Colonies in Baby Food**

ABSTRACT

The purpose of this lab was to demonstrate how at certain temperatures bacteria will grow and more specifically, what temperatures baby food should and should not be stored at for a motherÆs purpose. In all three experiments, for baby food set at a temperature higher than 20C, I placed an open jar in an incubator set at a specific temperature. In temperatures set lower than 20C, I placed an open jar in either the freezer (-10C) or in the refrigerator (4C). For each experiment, the control was an opened jar of baby food set a 20-22C (room temperature). Each jar was opened and exposed to its specific temperature for an hour. Then I placed a swab of a sample onto a petri dish, filled with nutrient agar, and let it grow for ten days in a room set at 20C. In the first experiment, I tested Gerber Chicken and Gravy baby food. The average number of bacterial colonies at 20, 30, 50, and 75 degrees Celsius were 6, 8, 4.7, and 2. In the second experiment, I tested EarthÆs Best Vegetable Turkey Dinner organic baby food. For my results, the average number of bacterial colonies at -10, 4, 22, and 40 degrees Celsius were 1.3, 3.5, 5, and 7.7. The bacterial colonies did not grow as well when set at colder temperatures because the cold restricted the bacterial development. In the third experiment, I tested Gerber Pear baby food. The average number of bacterial colonies at 22, 30, 35, and 40 degrees Celsius were 3.7, 9, 13, and 25. A pattern for all three experiments was that bacteria increased when exposed to temperatures between 20C and 40C. Bacteria growth decreased when exposed to temperatures lower than 20C and higher than 40C.

NAME(s) **Madison Hewitt**

PROJECT NUMBER **S10**

SCHOOL Barre Town Middle School

GRADE 8

TEACHER Jennifer Aither

PROJECT TITLE **Scare Fair**

ABSTRACT

This project was an exploration of how gender and fear are related. We tested whether there was a correlation between heart rate in males and females when they were exposed to a stimulus of fear.

NAME(s) Evan Hill

PROJECT NUMBER P12

SCHOOL Rutland High School

GRADE 11

TEACHER Dawn Adams

PROJECT TITLE **Cork or no Cork**

ABSTRACT

○The purpose of the experiment was to test the effect of corking on baseball bat ôpop.ö My hypothesis was that the corked bat would hit the ball further because it was lighter and had a faster swing speed. I did this experiment because I wanted to see how big of an effect the cork would have on the bat and if it is really worth the trouble of corking it and the penalties that can come from using it. The procedure included measuring the mass of the bat then attaching it to the swinger. Then I would pull the bat into the bungee cord two feet and release it. After this I would record the distance traveled. I would repeat swinging the bat for ten trials. After that I would repeat these steps for the three inch corked bat then the six in corked bat. The data does not support the theory that the corked bats would propel the ball further. The data shows how the corked bats actually propel the ball a shorter distance. I concluded that the hypothesis was rejected by the experiment.

NAME(s) Lydia Hoffman

PROJECT NUMBER G13

SCHOOL Northfield Highschool

GRADE 11

TEACHER Cynthia Tomczyk

PROJECT TITLE **The Effect of Wind and Temperature on the Amount of Voltage Produced by a Photovoltaic Pan**

ABSTRACT

The two experiments tested the effect of 2 variables found in nature, that are considered when selecting the best place for solar panels. The control for the experiments was the PV panel at 62 degrees Celsius, directly under the light with no wind. The control data recoded was after 5,10, 15 minutes: 514mV, 509mV, 503mV respectively were produced. The first experiment was on the effect of temperature on the amount of voltage produced. The data was obtained by testing the effect of temperature when placing the Photovoltaic panel under the lamp, recording the voltage produced at different temperatures; the variables are 35, 30, and 25 degrees Celsius. When the temperature was 35 degrees the voltage produced after 5, 10, 15 minutes was 545mV, 533mV, 531mV respectively. When the temperature was 30 degrees the voltage produced after 5, 10, 15 minutes was 536mV, 533mV, 529mV respectively. When the temperature was 26 degrees the voltage produced after 5, 10, 15 minutes was 556mV, 546mV, 534mV respectively. The general trend was, as the temperature decreased the amount of voltage produced increased. The next experiment tested the effect wind has on the amount of voltage produced by the PV panel. The data was obtained by placing the light directly above the PV panel and the fan blowing down on it. The variables tested were the 3 levels on the fan. When fan was on level 1 the voltage produced after 5, 10, 15 minutes was 528mV, 523mV, 521mV respectively. When the fan was on level 2 the voltage produced after 5, 10, 15 minutes was, 530mV, 527mV, 524mV respectively. When the fan was on level 3 the voltage produced after 5, 10, 15 minutes was, 533mV, 531mV, 528mV respectively. The trend was as more wind blew onto the fan more voltage was produced

NAME(s) Andrew Holt, Karyka Taylor
PROJECT NUMBER GP04
SCHOOL Main Street Middle School
GRADE 8
TEACHER Amy Kimball

PROJECT TITLE **Is It Really Compostable?**

ABSTRACT

How do products claiming to be ôcompostableö actually decompose compared to other products? This experiment tested different products and how they decompose compared to each other. We predicted that the ôWorld Centricö straw would decompose the fastest because it is made of the thinnest material. In this experiment, four different products were placed evenly apart in a compost bin. Over the course of five weeks the items were kept in the compost bin to decompose. Each week the objectÆs decomposition was compared to one another and the items were weighed on a triple beam balance. The data that was collected did not support the hypothesis that the straw would show the most percent decrease in weight. Instead, all items increased in weight and the fork had the least percent increase in weight. Knowing this we can conclude that some companies arenÆt telling the whole truth about their product or some of these products may decompose after a longer period of time. Next time it would be interesting to test these different products for longer periods of time.

NAME(s) Philip Holt
PROJECT NUMBER S11
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Personality and Politics**

ABSTRACT

○

○The purpose of this experiment is to determine whether certain personality types and factors correlate to certain political ideologies. The hypotheses in this experiment is that feeling preference in decision making will correlate with libertarianism and liberalism, thinking preference in decision making will correlate with conservatism and authoritarianism, a preference for slow and highly-informed decision making will correlate with centrism, and a preference for quick judgments will correlate with extremism. ○

○Testing will consist of administering two surveys. One, based off of the work of political theorist David Nolan, will determine political views, out of libertarian, liberal, conservative, authoritarian and centrist. The other is a Keirsey Temperament Sorter, which quantifies a respondentsÆ personality type into a four-letter code, out of a possible eight letters. Confidentiality will be preserved by giving each participant an alpha-numeric code that will be used to link their two surveys, but never used in conjunction with their name.

○Results from these two questionnaires will then be analyzed using a self-selection ratio (SSR), a statistic used to determine if a certain attribute is over or under-represented in a group. SSRs will be performed for each of the political ideologies as groups, and each Keirsey letter as an attribute. With 5 groups and 8 letters, 40 SSRs will be generated in total.

○

○Data collection is currently incomplete, and will be conducted from the 20th to the 30th of March.

NAME(s) Vivian Huang
PROJECT NUMBER G14
SCHOOL South Burlington High School
GRADE 9
TEACHER Curtis Belton

PROJECT TITLE **Biosorption of Heavy Metals by Pleurotus ostreatus (Oyster Mushroom)**

ABSTRACT

Lead and cadmium are two predominant forms of aqueous pollutants. Being heavy metals, they are harmful because of their toxicity and non-biodegradable nature. The purpose of this experiment was to investigate the effectiveness of Pleurotus ostreatus, the oyster mushroom, as a biosorbent of heavy metal contaminated water, and to determine the optimal pH range of initial heavy metal solutions for doing so. It was hypothesized that a pH value of 4.0 would yield greatest uptake capacity and removal of lead and cadmium ions.

In the batch biosorption-equilibrium experiments, the control group was comprised of dried P. ostreatus mycelial biomass and standard solutions prepared by mixing water with lead or cadmium chloride salts. The dependent variable was pH value of the initial solution, while the independent variable was uptake of heavy metal by the biosorbent. Confounding variables were avoided by keeping conditions uniform throughout all systems, with exception to the biosorbent itself. Microwave-assisted nitric acid digestions of isolated biosorbent were taken and used in conjunction with an inductively coupled plasma optical emission spectrometer (ICP-OES) to measure the amount of biosorption.
Experimentation is incomplete as of yet. Data will be analyzed using the Langmuir and Freundlich isotherm models to calculate maximum adsorption capacity for varying pH values and to determine P. ostreatusÆs removal method.

Nonetheless, it is expected that with an initial solution pH value of 4.0, Pleurotus ostreatus biomass is potentially a cost-effective, environmentally sound method for treatment of heavy metal contaminated effluent.

NAME(s) Melanie Hubbard
PROJECT NUMBER B32
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **Aw Sugar!**

ABSTRACT

ôAw Sugarö Abstract
By Melanie Hubbard
○The purpose of my experiment was to test if sucrose would convert to glucose fastest in the presence of the enzyme invertase in order to mimic the natural process that takes place in human intestines. To do this, I measured the glucose concentration in five different foods by using Diastix Reagent Strips for testing glucose concentration. After I took this measurement I added the invertase and waited ten minutes and tested again with another strip. Each time I tested the concentration of glucose again, it was increased for the sucrose was converting and breaking down into glucose and therefore the concentration was increasing. Glucose is the most pure form of sugar that the body can absorb, so everything humans eat must undergo this process before it can be efficiently used by the body. The enzyme that occurs in human intestines is called sucrase, but using sucrase can become very cost prohibitive. Invertase occurs naturally in plants and yeast; therefore many scientists use it as a sucrase substitute.

NAME(s) Timothy Hughes
PROJECT NUMBER P13
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar
PROJECT TITLE **Hydrogen Electrolysis**

ABSTRACT

Abstract
Hydrogen has a great potential to be an effective renewable energy source. Efficient hydrogen production is an important part of the nationÆs goal to diversify energy resources and promote energy security, sustainability, urban air quality, economic vitality, and reduce the carbon footprint. Although hydrogen does not exist naturally in its molecular form, it is the simplest and most abundant element in the universe, is high in energy, and produces little or no pollution when burned. Hydrogen, a component of water, can easily be extracted from water through the process of electrolysis. Electrolysis uses electrical current and metal catalysts to separate water into its components, hydrogen and oxygen. Combining hydrogen production with other renewable energy sources that generate electricity such as wind, solar photovoltaics, ocean, and hydro technologies would promote sustainability. However, the metal catalysts used in electrolysis are expensive and susceptible to corrosion. Finding a catalyst that sustains the least amount of corrosion but produces the greatest amount of hydrogen efficiently is the challenge. This experiment will show that water conversion to hydrogen and oxygen has a high efficiency rate and the type of metal used has an impact on the efficiency rate. Four metal catalysts (zinc, copper, aluminum, and iron) were used in a self-engineered, homemade electrolyzer and tested to determine which metal produced the most hydrogen within an allotted time frame while sustaining the least amount of corrosion. Results indicate that of these four metals, iron is the most efficient, followed by copper and then zinc. Aluminum was not successful as a metal catalyst during electrolysis since a negligible reaction occurred with no measureable amount of hydrogen produced.

NAME(s) Casey Husband
PROJECT NUMBER B33
SCHOOL Windsor High School
GRADE 9
TEACHER Jennifer Townsend
PROJECT TITLE **The Spartan Project - Weight distribution for endurance in the military**

ABSTRACT

The problem studied in this experiment was the large amount of weight that soldiers carry. The experiment gave way to multiple forms of making this weight easier to manage. The hypothesis was that when you have weight closer to the center of your mass, it will be easier to deal with. The procedures included running a set distance (at the same time of day, and temperature) with two different orientations of gear. Each variation of gear weighed the same, but the distribution varied. The principle findings to this experiment, was that when you have weight oriented to your center of mass, it will be easier to handle. The trials supported this when the weight that was arranged around the chest and back, had faster trial results when compared to the counterpart. In correspondence to these results, mobility, agility, and the speed of the user all increased. The experiment concluded that when excess weight is placed on the human body, it is easier to do deal with when it is conformed around a personÆs center of mass. Although these results concluded in the difference of seconds, seconds are the difference between safety and fatal injury on the battlefield. Which is something our soldiers, friends, or maybe even family, face everyday overseas.

NAME(s) Curtis Ianni
PROJECT NUMBER P14
SCHOOL Saint Francis Xavier
GRADE 8
TEACHER Mary Ellen Varhue

PROJECT TITLE **Radical Roofing**

ABSTRACT

○The reason I chose to do an experiment concerning solar panels is because I am really interested in the subject of energy conservation because the earth is running out of fossil fuels and we are going to eventually need an alternate source of energy. Solar panels provide a nearly infinite source of energy. They can help improve fuel efficiency in certain environments and produce power for us when fossil fuels are gone.

My project has three major hypotheses. The first hypothesis is that solar panels used with lighter color roofing shingles produce more voltage than solar panels used with darker color roofing shingles. The second hypothesis is that solar panels produce more voltage in higher temperatures. The third hypothesis is that solar panels produce more voltage with less humidity.

I tested the effects different color roofing shingles had on solar panels using white, light brown, green and dark brown roofing shingles and measured the voltage each one produced in the same controlled environment. I tested the effects of temperature by using a heat lamp to increase the temperature and measured voltage at different temperature increments. I tested the effects of humidity by using a shower and a humidity measuring device and measured the voltage at different humidity levels.

Even though my results using different color roofing shingles were inconclusive, I did find that the solar panels produced more voltage in lower temperatures and less humidity. These results are useful because they can help people decide which climates are best suited for solar panels. This will help improve overall efficiency and provided a partial solution for our fossil fuel crisis.

NAME(s) Peter Jaarsma
PROJECT NUMBER B45
SCHOOL Windsor High School
GRADE 10
TEACHER Jennifer Townsend

PROJECT TITLE **Sheep and Color Patterns**

ABSTRACT

The purpose of this scientific inquiry was to see if a cognitive pattern could be formed in a mammal (sheep) linking color to a food item. The hypothesis was: if sheep are given grain in a certain colored bucket every 24 hours for 14 days, then they will go to that color bucket first repeatedly when there is no trace of food in it, because they will have been patterned to recognize this bucketÆs color as representing food.

The procedure of this experiment was to place grain in a bucket of a certain color and to switch the position of this bucket following a pattern every twenty-four hours for fourteen days. Three different color buckets were used; grain was exclusively placed in the yellow bucket. The sheep were able to see the placement of the grain on the first two days, after which the grain was placed without the sheep being present. On the ninth day of cycling the buckets through the pattern and observing to which color the sheep went to first, the buckets were all washed thoroughly with soap and water. They were placed back into the appropriate spots, and left empty. The sheep were let out and it was observed which bucket they went to first. Grain was placed in the yellow bucket after ten minutes, for the next five days the buckets were washed and placed empty when the sheep were let out.

The principle findings of this experiment were that sheep did form a strong tendency to go to the yellow bucket first; the last five days of the experiment they went to this bucket primarily each day. The conclusion drawn from these results is that it is possible for a sheep to form a pattern linking a colored entity to food.

NAME(s) **Evan Jones, Alex Pollack** PROJECT NUMBER **GP02**

SCHOOL Fredrick H. Tuttle Middle School GRADE 7

TEACHER Christopher Towle

PROJECT TITLE **Does Age Affect Reaction Time???**

ABSTRACT

We conducted a study to answer the question, ôDoes age affect reaction time?ö We hypothesized that reaction time would increase with the age of an individual. Our hypothesis states that age will increase reaction time because as a human grows older, the muscles expand and restrict the intersections between nerves, resulting in a higher reaction time. We tested our hypothesis by testing reaction times of residents of South Burlington who varied in ages (ages 8 to 83). The experiments were conducted all in a day. The procedures were as follows: the test subject was to hold their hand out while we dropped a meter stick between their thumb and index finger. The subject would catch the meter stick after its release. We recorded the number of centimeters the meter stick dropped before being caught. A lower centimeter score would result in a faster reaction time, while a higher centimeter score represented a slower reaction time. Each subject had three attempts. We made scatter graphs to understand our data, and plotted age on the horizontal axis and the average reaction time (average of the three attempts) on the vertical axis. Our graphs suggested that reaction times were all over the place and didn't seem to be linked to age. For example, Evan tested an 80 year old and an 83 year old. The 80 year old had a better average than a 50 year old. However, it appeared that that the older you were, the more consistent your scores were. Many variables affected the experiment. One of them was gender. Males seemed to have a faster reaction time in general, but the lowest catch was 8cm from a woman. The other possible variables were dominant hand and the possible hand-eye coordination. In conclusion, reaction time may not be affected by age.

NAME(s) **Casey Keenan** PROJECT NUMBER **C12**

SCHOOL Saint Francis Xavier GRADE 7

TEACHER Mary Ellen Varhue

PROJECT TITLE **Scuba Pro**

ABSTRACT

○My project was how does pressure affect different breathable gases. The purpose for doing my Science fair project was to find out how different pressures affect the human body. I wanted to do this because I am a scuba diver and I wanted to find out what gases would be better for scuba divers to breathe underwater.

○What I originally intended to do was measure which gas compressed the most, But over the course of doing my project I found that both of the gases I tested compressed at the same rate. What I ended up measuring was the different percents of oxygen and nitrogen at different depths.

○For this project I went to a scuba diving shop, and the people there allowed me to use the air compressor they had there. I tested two gases, normal compressed air and Nitrox. I compressed each sample, sent it to a tank and took an oxygen percent reader to find the percent of oxygen and of nitrogen. Then I used an equation to get what the different percents would be at different depths.

○What I found through the process of this experiment was that Nitrox has a larger percent of usable oxygen than normal compressed air does.

○My science fair showed me that Nitrox is a safer gas to use, but you cannot go down as far. With normal compressed air you have a larger chance of getting sick, but you can go down farther.

NAME(s) Rachel Kiefaber
PROJECT NUMBER P15
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar
PROJECT TITLE **Optimizing the Sun**

ABSTRACT

The purpose of this experiment is to figure out how to maximize solar energy production by changing the angle of solar panels. My hypothesis was that the solar panels set up at optimum tilt angle (about 63 degrees) would produce the most energy (measured in volts) because those panels would be directly facing the sun for most of the day. To find optimum tilt angle in October (when I performed the experiment): multiply latitude by 0.89, then add 24 degrees (latitude of Rutland, Vermont: 72.98 degrees), therefore 72.98 times 0.89 plus 24.00 equals 88.95 degrees. I built five different platforms on which to place two panels each. Each set of panels was positioned at a different angle: 0, 20, 40, 63, and 80 degrees. I placed these panels in the middle of my backyard and recorded the voltage they produced with a multimeter at five different times each day for four days: 10:30, 11:30, 12:30, 1:30, and 2:30. Then I created a graph to show the average voltage produced by each panel at each time of the day. The results show that my hypothesis was incorrect since the 63 degree panels did not produce the most volts. The 20 degree panels, on average, 0.236 more volts than the 63 degree panels. Most of the time I recorded data it was very cloudy, and the clouds refracted the sunÆs rays, making my optimum tilt angle calculations less significant. This is part of the reason my data did not affirm my hypothesis. When setting up solar panels for heating or electrical purposes, it is advisable to be able to adjust the angle of the panels because even a slight change in the angle measure can greatly increase the overall efficiency of the panel.

NAME(s) Finley Killeen, Brandon Lee
PROJECT NUMBER GP05
SCHOOL FHTMS
GRADE
TEACHER Amelia Lutz
PROJECT TITLE **Leaf Energy**

ABSTRACT

Leaf Energy
Abstract:
○Renewable energy is what many people are turning to preserve the environment and stop global warming, but what are the alternative choices? There are many choices, but the one that caught our eye was biomass energyû the alternative energy that weÆve been using since the ancient times. One form of biomass energy you might recognize today is burning wood in a fire. Some other forms of biomass energy is burning waste, organisms or anything that is dead and organic. You might think that biomass energy is killing nature just like fossil fuels, but itÆs not as long as youÆre using a limited amounts of nature or dead organic materials. If we can burn things to create energy, couldnÆt we just use dead leaves? This lead us to the question and our purpose, ôwhich kind of leaves release more energy, deciduous (leaves that fall every year) or coniferous trees (leaves that donÆt shed and stay green year long).ö To test how much energy each kind of leaves have, weÆre going to perform an experiment using a calorimeter. The calorimeter measures how many calories, which is a measure of energy, are in a material. We are going to use a ring stand with two clamps, one to hold a test tube with water and another to hold the thermometer clamp. We will burn our leaves to see which one get the water warmer. We will measure the starting and ending temperature of the water. At the base of the clamp, weÆre going to put a glass jar, an insulator of heat, with a hole on the top of its metal lid. The thermometer will go in the test tube of water, which will go into the jar and touch the fire. We will use the heat equation to determine the calories in each substance.

NAME(s) **Samantha King**

PROJECT NUMBER **B14**

SCHOOL South Burlington High School

GRADE 10

TEACHER Mr. Belton

PROJECT TITLE **Effects of Microwaves on Bacillus subtilis**

ABSTRACT

The purpose of this experiment was to determine the effects of microwaves on the reproduction of the bacteria, Bacillus subtilis.
The control group of this experiment consisted of the bacteria, B. subtilis, heated by means of hotplates. The dependent variable of this experiment was the reproduction rate of the microwaved bacteria, while the independent variable was the means of heating. Before and after experimentation, the B. subtilis were observed and population numbers were recorded.
Data collection is not yet complete; however, it is expected that the reproduction patterns of the B. subtilis heated by the microwave will be altered. The data will be analyzed to determine any effects that the different forms of heating have on the reproduction of the bacteria. Once experimentation has concluded, the analysis will state which form of heating is more detrimental to the reproduction or existence of the bacteria B. subtilis.
Experimentation with microwaves will determine whether microwaves are harmful to the health of bacteria, and whether the health risks found through this experiment are worth the convenience of quickly heating food.

NAME(s) **Eric Knapp**

PROJECT NUMBER **P16**

SCHOOL Home school

GRADE 9

TEACHER Marcia Knapp

PROJECT TITLE **Flatline fact or fiction?**

ABSTRACT

Flatline fact or fiction

Paintball is a combination of tag, capture the flag, and hide and seek.
It can be a very expensive sport. Guns, called markers, can cost anywhere from $40 to over $1200. One simple modification to paintball guns is different barrels. Possibly the most eccentric barrel is a Flatline, which uses an upward arc to give the ball backspin, making the projectile fly farther with a flatter trajectory.○
The company which produces The New Flatline« Platinum Series Barrel, advertises that it ôfeatures quick thread design that easily attaches like any other barrel. Designed for range and accuracy, and eliminating the need to arch your shot, the Tippmann« Flatline Barrel System uses patented technology to create backspin for a level and precise shot. Increases range by 100 ft.ö
The basics of my experiment are to test the range of the flatline barrel, the effect of overall FPS (feet per second) on the accuracy and amount of breaking the paintball in the barrel. Experience shows if the gun is set 280 FPS, the arch in the barrel will sometimes break the ball before it leaves the barrel. Two things happen: the barrel gets dirty so the gun will end up breaking more paintballs, and the ball is wasted. After completing the testing and analyzing the results, data showed that the Flatline barrel shot further with accuracy (60 ft) than the regular barrel (40ft). The claim of the company to shoot further is accurate. However, experimentation failed to demonstrate the companyÆs claim of shooting accurately to 100ft.

Eric Knapp

NAME(s) Ashley Larrabee
PROJECT NUMBER S12
SCHOOL Hinesburg Community School
GRADE 8
TEACHER Stephanie Konowitz

PROJECT TITLE **Brain Teasers**

ABSTRACT

I wanted to know if boys or girls could accurately solve or complete brain teasers faster. I wanted to learn about this topic because, one of the brain teasers prove that spelling doesn't make a difference, as long as all the letters are there. It was really important to know how the stroop effect came in while reading the ôSay the Color not the Wordö brain teaser. For each trial I took the subject to a quiet space and I recorded their gender and grade before starting. I would start each time by testing the ôSay the Color not the Wordö brain teaser, I would then record how many mistakes then I would test on the ôNumbers as Wordsö brain teaser I would continue to test the ô Letter Scrambleö I would record how long it took to do both brain teasers as different times. After I finished I learned that girls overall had less mistakes and took less time to complete.

NAME(s) Davis Lavoie
PROJECT NUMBER S13
SCHOOL Mater Christi School
GRADE 6
TEACHER Mr. Mark Pendergrass

PROJECT TITLE **"Did I Just See That?" - Subliminal Messaging**

ABSTRACT

The Science Fair Project titled ôDid I Just See That? Subliminal Messagingö attempted to figure out if subliminal messaging affected a participantÆs choice on a test. My hypothesis stated that if a subliminal message is placed in a video then it will affect a personÆs choice on a test. Research done on this topic shows that people may be affected by subliminal messaging. Additional research shows that the effect of subliminal messaging may depend on what type of message it is; text, pictures or other types of subliminal messaging. The procedure for this project involved two groups; one group watching a video with a subliminal message in it, and the other group watching a video without a subliminal message. Participants were asked to sign a waiver that described the procedure and asked their age and gender. Then the participants watched a video (either the one with the subliminal message or without) and were asked to take a one question test. The front page of the test read: ôWhen you flip this page you will see four pictures. Circle the letter on you answer sheet that corresponds to the picture that comes first to your mind.ö The four answer choices were: an orange, a banana, grapes or an apple. The results were recorded in the data table. The subliminal message was a picture of grapes. The results show that the participants who saw the video with the subliminal message chose grapes as their test answer more often than those participants who saw the non-subliminal message video. This means that my hypothesis is correct.

NAME(s) **Brittany LeBeau**

PROJECT NUMBER **P17**

SCHOOL Windsor High School

GRADE **12**

TEACHER Jennifer Townsend

PROJECT TITLE **Converting exhaust emissions into electricity**

ABSTRACT

The purpose of this experiment was to investigate the electrical potential of exhaust fumes. My hypothesis was that the regular unleaded gasoline will yield the most voltage, because it has a lower octane level, thus containing and emitting more additives that could increase the overall temperature of the exhaust fumes. This inquiry was conducted using three different octane levels of gasoline, a lawnmower, and a thermocouple.

The procedure included running a lawnmower with one type of gasoline for four minutes, measuring the change in temperature after certain time intervals, and comparing the results with the data from the two other gasoline types. The results can be put into a thermocouple calculator to convert temperature to electric volts. This information can be used to determine the electrical potential of exhaust waste, which can help create recyclable energy within the car systems.

The results concluded that there is not a significant temperature difference between the three different octane levels of gasoline. The octane levels were not of a large enough range to give diverse results, thus not creating a true connection between temperature change and the amount of additives in gasoline.

NAME(s) **Augie Levins**

PROJECT NUMBER **G15**

SCHOOL Rutland High School

GRADE **10**

TEACHER Mr. Michael Ellis

PROJECT TITLE **Geothermal Heat Pumps**

ABSTRACT

Problem Studied: Is there heat under the ground which can be used to heat our buildings?

Procedures Used: I dug a hole in the ground five feet deep in a random flat location and not near any man-made structure. I placed a 10-gallon styrofoam cooler filled with water on the ground surface. I put 20 feet of three quarter inch outer diameter tubing (one half inch ID) into the hole strait down and up and filled it back up with dirt. The ends of the tube went into the cooler. I connected a utility pump to the output tube. The pump pushed the water from the cooler down through the tubing into the ground and back into the cooler.

Findings: On the day of the experiment, both air and water temperature started at 0 C (32 F). The water ran through the system for a total of 180 minutes (3 hours). I tested water temperature every 30 minutes. During the 180 minutes of pumping, the water reached a high temperature of 9.4 C (49 F).

Conclusions: At its warmest, I found that the ground heated the water by 9.4 C (which is a 17 F increase). There is an easily accessible source of heat in the ground. It may not increase the building temperature to the human comfort level of 16.6 C (62 F) that we are used to, but it can raise the starting point and then conventional methods could be used to heat the rest. Geothermal heat is a source of heat that we ought to use to heat our homes.

NAME(s) Andrew Levite
PROJECT NUMBER G16
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Amount of feeding on water nutrient levels**

ABSTRACT

The Purpose of the experiment is to determine the effect that different amounts of food consumed by fish would have on the levels of ammonia, nitrites and nitrates in the water. In conducting this experiment, it is hypothesized that the higher amounts of food pellets fed to fish will raise ammonia levels, as well as the nitrite and nitrate levels of the water.

The control group in this experiment was a recommended three pellets of fish food for the betta fish, twice a day. Everything else in the experiment (aquatic plant type, amount of water, fish, etc.) remained constant. The dependent variable is the ammonia, nitrite, nitrate and pH levels of the water, while the independent variable is the amount of pellets of fish food being fed to the fish. The water nutrient levels, along with the pH, will be tested every other day for the remaining month.

Data collection is incomplete at the moment; however, it is expected that the more the fish eat, the more waste it will excrete and the higher the ammonia, nitrite and nitrate levels will be for the tank the fish is in. The data that is collected will initially be analyzed to discover any changes in these levels through the control and the experimental group.

NAME(s) Rachel Lia
PROJECT NUMBER G17
SCHOOL South Burlington High School
GRADE 10
TEACHER Mr. Belton

PROJECT TITLE **water purification**

ABSTRACT

The purpose of this experiment is to determine the best way to purify water with easily accessible materials. Unsafe drinking water is a hazard to many developing countries all over the world. It is important that these people have a safe and easy means of purifying their water.

The control group is a sample of water that has been run through a Brita filter. The dependent variable is the contaminants in the water and the Independent variable is the method used to purify the water. Before and after each test the water must be tested for pH. levels, salt content, and what bacteria are living in the water.

There are various ways to purify water which get rid of many contaminates in the water. Boiling water is a classic effective way of cleansing water. Exposure to uv light has also been known to eliminate bacteria. Some hikers have even been known to filter water through Coffey filters or even cottonballs to get rid of some of the visible contaminates in water. How effective are all these methods though and do they get rid of all contaminates?

Data collection is still on going right now however the expected outcome is that boiling water will be the most effective way of purifying water. Water is an essential part of life and no one can survive more than a few days at most. Having an easy way to purify water in many developing countries could help to improve the quality of life.

NAME(s) Christina Lovett
PROJECT NUMBER M03
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **Comparison of Four Potential Parameters for Predicting Radiation Pneumonitis in Lung Cance**

ABSTRACT

Radiation Pneumonitis occurs when radiation causes inflammation in healthy lung tissue. Radiation oncologists try to prevent lung toxicity by creating a Dose Volume Histogram (DVH) in treatment planning. This graph compares the dose of radiation (Gray) given to volume of lung (in percent). Doctors attempt to give 10 Gy to no more than 40% of the lung volume (V10) and 20 Gy to no more than 20% of the lung volume (V20) to prevent pneumonitis.

My hypothesis is that the area under the DVH curve (AUC), measured by the integral of the curve, is a valid measure of lung exposure to radiation, more so than the other variables that examine only points on the DVH curve.

In twenty-one consecutive patients, I calculated the AUC, V10, V20, and the mean lung dose and compared them using regression coefficients. I found that three parameters, the V20, the mean lung dose, and the AUC, had a strong relationship with each other. The V10 did not have a strong correlation with the other variables.

I also converted the AUC measured in cGy versus percent of lung volume, to Gy versus kilogram of lung tissue. This measures the AUC in Joules (Gy/kg) given to the lungs. The number of Joules given to the lungs was closely related to the V20 and mean lung dose, but the relationship was not as close, most likely because it introduced a new variable, total lung volume to the analysis.

A prospective clinical trial could now be done with pulmonary function testing done before and after radiation therapy to test this easily measured parameter for its predictive power for radiation pneumonitis risk. Further research must be done to determine whether is truly useful in the delivery of safe radiation to lung cancer patients.

NAME(s) Sean MacDonald
PROJECT NUMBER G18
SCHOOL South Burlington High School
GRADE 10
TEACHER Mr. Belton

PROJECT TITLE **Escherichia coli from farms to waterways**

ABSTRACT

The purpose of this experiment was to determine whether or not Escherichia coli are entering the environment through waterways that are in close proximity to farms. The hypothesis for this experiment states that while some farms will have high amounts of E. coli entering the nearby waterways, some farms will better manage the bacteria and there will be very minimal amounts of E. coli in the water.

The control for my experiment is the water upstream from the farm site. The experimental group is the water at and below the farm site. The dependent variable for this experiment is the count of E. coli. The independent variable(s) are the different farms and the areas of water that will be tested. What is meant by that is water above, at, and below the farm site. The amount of E. coli will be measured in a lab test that will be done by the Vermont Department of Health in the Vermont Department of Health Laboratory. The count will be found by using a water testing kit that finds that count of coliforms.

One of the farms displayed results that are confusing because all of the E. coli levels are so similar. For the other farm, the levels of E. coli were by far the highest at the source which shows that E. coli is entering the water from the farm as well as higher levels above than below which shows the water is carrying the E. coli

NAME(s) **Alexandra Marek, Katherine Gurin, Emily Couture**

PROJECT NUMBER **GP20**

SCHOOL Barre Town Middle School

GRADE **8**

TEACHER Jennifer Aither

PROJECT TITLE **Rainbow Flames**

ABSTRACT

This is an exploration of how different chemicals create different colored flames when burning. It is a connection to astronomy and spectrometry as well.

NAME(s) **Peter Maurice**

PROJECT NUMBER **S14**

SCHOOL Barre Town Middle School

GRADE **8**

TEACHER Jennifer Aither

PROJECT TITLE **Affects of Electronics on Sleep**

ABSTRACT

This project was an exploration on how sleep is affected by use of electronics before bed. I test time with electronics and without electronics and analyzed how my sleep patterns changed.

NAME(s) **Robinson McCormick**

PROJECT NUMBER **P18**

SCHOOL Saint Francis Xavier

GRADE 8

TEACHER Mary Ellen Varhue

PROJECT TITLE **Tidal Here _____**

ABSTRACT

○My experiment tested whether the efficiency of tidal barrages is affected by variances in water temperature or salinity. The variables for these tests were the amount of salt in the water and the water temperature. These variables reflect differences in water in locations throughout the Earth.

○I chose this topic because I am interested in electricity, but wanted to study something new to me. I was familiar with water turbines, but not tidal barrages. As I learned more about tidal barrages in my research, I became increasingly interested in them and the science behind them. Barrages work by creating basins close to tidal areas. The flow of the tides fill the basins; when the water peaks, the barrage door opens and the water flows out over the turbines. The flow of water over the turbines generates electricity.

I hypothesized that increasing the salinity and thus the density of water would increase the flow of water over a turbine and that increasing the temperature of the water would also increase the flow. For the density experiment I drilled a hole in a five gallon bucket and used a plastic propeller to simulate the water turbine. I used different amounts of salt to determine if there was a correlation between the density of the water and the number of times the propeller spun. I used freshwater, the average salinity of ocean water, and five times ocean water salinity. For the temperature test I used the same setup, this time changing the temperature of the water. I used cold water, room temperature water, and hot water.

For the density test my hypothesis was correct: the denser the water the more the propeller spun. In the temperature test I predicted accurately that the hotter the water the more the propeller spun.

NAME(s) **Colton McCracken, Nathan Adamczak, Kyle Putnam**

PROJECT NUMBER **GP21**

SCHOOL Northwest Technical Center

GRADE 11

TEACHER Doug Bell

PROJECT TITLE **Structure Tester**

ABSTRACT

Bending Beam Load Cell For Structure Tester

Our Engineering Technologies class is in the process of creating a structure tester. The was that we needed to design a method for measuring a force between zero and five hundred. The constraints were that the scale had to have minimal deflection, a one with a linear response, and is also temperature compensated. What our solution was to have the Strain Gage in Wheatstone Bridge Configuration because it will offer most of the features with only a few limitations. One of those limitations is that they have a small output signal.

NAME(s) Katherine McLane
PROJECT NUMBER B34
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Exercise and Memory Retention**

ABSTRACT

The purpose of this experiment was to find the relationship between physical exercise and short and long term memory retention. Studies have shown that exercise can stimulate neurogenesis, the generation of brain cells, but it is unknown if this neurogenesis has an effect on the memory of humans. The hypothesis is that students that exercise more will have better short and long term memory.
In this experiment, high school students that partake in varying levels of physical activity were tested. Their physical activity level was measured by a physical activity survey and their memory by a short and long term memory test. The independent variable is the amount of exercise the student gets. The dependent variable will be their level of short and long term memory retention. The control will be the group of students that receive minimal to no exercise.
The data collection process is incomplete at the moment, but based on the current data it is expected that there will be no significant link between exercise and short and long term memory. All data collected will be analyzed on a comparative basis
Further understanding of the link between exercise, neurogenesis and memory could help to create new methods of memory preservation and restoration.

NAME(s) Patrick McMackin
PROJECT NUMBER G19
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Road Salt's effect in South Burlington**

ABSTRACT

The purpose of this experiment was to determine the salt levels caused by road salt in the soil/water levels in South Burlington, and then to determine whether those salt levels inhibit the growth of plants. Soil/water samples were taken throughout the winter at two different locations in South Burlington. Then using the salt levels found in those samples, plants were grown using water with salt levels both higher and lower than the concentration of salt found in the city. It was hypothesized that the salt levels that were found in South Burlington isnÆt enough to inhibit the growth of plants.
○In this experiment there was a control group of water that were given normal water, and the experimental groups were four different plants that were given water with the different salt levels found around the levels found in South Burlington. The independent variable was the level of salt concentration in the water and the dependent variable was the growth of the plants. The growth of these bean seedlings were to be determined by measuring the length of the beansÆ stalk.
○Data collection isnÆt completed at this time but from the data that has been collected now it can be predicted that the salt levels found in South Burlington isnÆt enough to inhibit the growth of plants. This data can be used to prove if South Burlington is doing a good job regulating the amount of road salt being using during the winter.

NAME(s) Kaden McSheffrey, Cody Rosa, Hamisi Wabuti
PROJECT NUMBER GP03
SCHOOL Barre Town Middle School
GRADE 8
TEACHER Jennifer Aither

PROJECT TITLE **How Yeast Affects Bread**

ABSTRACT

This project is an exploration of how yeast is used to make bread. It is also a comparison between bread with and without yeast.

NAME(s) Shannon Mee
PROJECT NUMBER C13
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **Flour's Affect on the Density of a Cupake**

ABSTRACT

Have you ever wondered why some cupcakes you ate were light and fluffy and some were extremely flat and dense? If your answer is yes, then keep reading! The purpose of my experiment was to see which flour gives you that moist delicate cupcake. To find this, I followed a recipe substituting the flour each time for either bread, cake, all-purpose, or gluten free flour. I then calculated the mass from a balance and volume through water displacement of each cupcake to find the density. Cake flour proved to give the lightest cupcake with a density of 3.51 grams per liter. Bread flour gave the densest cupcake of 7.78 grams per liter. Gluten free and all-purpose fell in between with densities of 5.18 and 7.00 grams per liter. Therefore it is now obvious to only use cake flour when baking and never ever use bread flour! This experiment can be expanded to many possible applications. An important research would be to improve the taste of gluten free foods. Since the gluten intolerance is growing in the United States, companies need to make ingredients suitable for all needs while still maintaining a good taste. Researchers could start right from this experiment by trying to make gluten free flour give the lowest density cupcake.

NAME(s) David Melkumov

PROJECT NUMBER P20

SCHOOL The Renaissance School

GRADE 6

TEACHER Caryn Shield

PROJECT TITLE **Strengthening Magnets**

ABSTRACT

Magnets are often used in situations where metallic metals like iron are being separated from other scrap metals, like in a trash dump. The magnets there would eventually get weaker over time and need to be strengthened back to full power. Magnets are also used in small devices like compasses, where it points to the earth's magnet pole. My experiment tested what would be the most effective way to strengthen a magnet. My hypothesis was that freezing a magnet would be the most effective way, because in all strengthening methods the magnet will start to realign its electrons toward its poles, but in freezing it will begin to realign faster.

To measure my results, I used a multimeter testing resistance. In my procedure I took nine different magnets of the same strength and froze three, sent a charge through three, and rubbed three against a much stronger magnet. I performed each test three times with three different magnets. Then I took my multimeter and measured change in resistance.

I found out that my results did support my hypothesis that freezing would be the most effective. One of the largest increases in resistance was 1,036 ohms, which resulted from freezing. The largest change by sending a current through the magnet was 610 ohms, and for the putting it near a stronger magnet category was 794 ohms.

The results show that if anyone wanted to strengthen a magnet, they would most likely freeze it because it is efficient and an easy task to do compared to having another stronger magnet, or sending a charge through one. This is also why things that have magnets in them are usually in cold temperatures or frequently cooled off so they stay strong, such as in electronics like computers.

NAME(s) Nadia Merali

PROJECT NUMBER B35

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Correlating Handedness to Side of Body Affected by a Stroke**

ABSTRACT

The purpose of this experiment was to determine whether handedness and the side of a personÆs body that was affected by a stroke are related. The results of this experiment will show whether more stress on one side of the body has an impact on the brain and what happens during a stroke (stress comes along with using one hand more). Dr. Christopher Commichau and Nurse Practitioner Ruby Souhan will allow use of their Stroke Clinics to gather the supporting data. In conducting this experiment, it was hypothesized that if you put more stress on one side of the body, that side will be affected during a stroke.

The independent variable in this experiment is a personÆs handedness. The dependent variable is which side of the body was affected by the stroke. This information will be collected by means of a survey given to a minimum of fifty patients.

Data collection is incomplete at the moment; however, it is expected that a personÆs handedness will influence where the stroke affects their body. The data will initially be analyzed to discover any correlation between the two variables. Furthermore, the analysis will yield graphs and charts comparing the data.

New discoveries that appear from this experiment could potentially help to further advance stroke prevention techniques.

NAME(s) David Mercier

PROJECT NUMBER B15

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Roger Belton

PROJECT TITLE **The Effects of Temperature and Lux Microcystis Aeruginosa**

ABSTRACT

The purpose of this experiment was to determine the effects of varied lux and temperature on Microcystis Aeruginosa. It was hypothesized that 10,000 lux and 26.666 degree Celsius will yield the fastest growth rate and the highest toxicity.

The control group was comprised of an algal culture kept under the following conditions: water salinity: 22 g.l (to the power of negative 1), 8.4 pH, 7,000 lux (12 hr. night/day cycle), stirring, and a constant temperature of 26 degrees Celsius. The independent variables are lux and temperature and the dependent variables are toxicity and cell growth. Measurements of the dependent variables will be taken every day. Cultures will be tested for toxicity before the experiment. Any toxic culture will be discarded.

Data collection is incomplete at this time. The data will be analyzed using statistical analysis. Analysis will also include lakes with conditions that have an environment similar to the various environments of the cultures in the experiment.

Discoveries relevant to the conditions necessary for the production of toxins in Microcystis Aeruginosa are relevant to a majority of lakes and reservoirs across the world. Accurate prediction of toxic blooms allows for adequate prevention.

NAME(s) Jane Merrick

PROJECT NUMBER S15

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **Learning Comprehension through Auditory and Visual Presentation**

ABSTRACT

The projectÆs purpose was to find whether the presentation of a short story through hearing or sight provided better learning comprehension. An audio recording was used to express hearing while text on a screen was used as sight.

The experiment had three groups, with the independent variable being presentation form and the dependent variable being survey results. The control group was given the text slides to read with the audio recording, meaning the control group was given exposure to both presentation styles. The second group was only given the audio recording to listen to. The last group was given just the visual text on a screen. After viewing the clip or listening to the recording, participants of every group were asked to fill out a survey consisting of five questions about facts presented throughout the story, five questions about why something happened, and one question asking for the participantÆs gender. The surveys were scored (one point for each correct answer). Surveys with the highest score will show which style of presentation was most effective.

The process of data collection is still occurring, however, it is hypothesized that the control group will score the best on the comprehension test, followed by the group with the visual, and lastly the group with the audio. This is because sight is regarded as the most important sense. Data will show which sense, hearing or sight, is the better sense to target where learning comprehension is concerned, and if it is in any way gender-dependent.

NAME(s) Natalie Meyer
PROJECT NUMBER S16
SCHOOL Hinesburg Community School
GRADE 8
TEACHER Stephanie Konowitz

PROJECT TITLE **Doll Studies**

ABSTRACT

Most girls are taught from a young age to grow up to fit a certain type of mold that is acceptable in our society today- from being a sports star to being a supermodel with crazy hair and makeup. This experiment was designed to test how the media impacts young girlsÆ decisions on what they want to look like or how they want to act when they become part of the teenage or adult world. About 50% of girls between the ages of 11 and 13 years old consider themselves overweight. I wondered if it was possible that distorted body images could start at an even younger age by showing girls in Kindergarten thru 4th grade four different dolls and asking them which of the four they wanted to look like and why. The four dolls included a Barbie doll, a Bratz doll, a Groovy girl, and a soccer/sports doll. I found that girls as young as 6 years old think that they have to grow up to be skinny and look like the Barbie. Or that some girls in 3rd grade think that they need to be a sports star to be successful in life. Through the process of this project I concluded that the media does in fact pose a threat to young girlsÆ decisions on how they want to act and look like when they grow up.

NAME(s) Abigail Millard
PROJECT NUMBER G20
SCHOOL Windsor High School
GRADE 10
TEACHER Jennifer Townsend

PROJECT TITLE **In Search of Fresh Water (Exploring Different Methods of Desalination)**

ABSTRACT

In our world of modern conveniences, we take our supply of fresh water for granted. However, we can lose that comfort when we may not expect it. A recent example includes areas of New York and New Jersey effected by Hurricane Sandy. When a natural disaster like this knocks out our power or access to fresh water, alternated methods such as desalination are needed. The purpose of this experiment was to find which method of desalination was most effective for small scale, emergency use. Effectiveness was defined based on time taken to desalinate, salt removed, and quantity of water produced. The hypothesis was, if solar, steam, and freezing methods are used to desalinate seawater, equal amounts of fresh water with similar salinities will result, because research showed comparable efficacies.○
○A simple solar still was used for the solar method. For the freezing method, a plastic container was filled with seawater and placed in the freezer. After 24 hours, the unfrozen salt water was scooped out of the frozen fresh water block. The steam procedure went through several stages. It was first done using a steam hood, but the results were extremely high in salinity. The procedure was redesigned with a teapot and copper tubing to eliminate salt contamination during boiling.
○Steam proved to be the most effective method in all aspects. Freezing was less effective due to a procedural flaw and solar due to lack of sunlight. Next time, the procedure would be further developed to increase the quantity of water produced.

NAME(s) Kasie Mills, Olivia Knudsen

PROJECT NUMBER GP24

SCHOOL Randolph Homeschool Co-op

GRADE 6

TEACHER Gina Sweet

PROJECT TITLE **Five Pennies or a Nickel?**

ABSTRACT

○○The purpose of the experiment was to determine whether or not people would be more likely to pick up five pennies or a nickel, or all of the above. We were also watching to see if men were more inclined to pick the change off of the floor more than women or children were.

Our hypothesis was that men would be more predisposed than woman to pick up the coins. We also predicted that the people who picked up the coins would only pick up the nickels.

○We did a small amount of additional research concerning other people who had done similar projects, and found that people in general are more likely to pick up nickels , but everyone is different.

○We started by going to our designated area and put the 5 pennies and 1 nickel on the ground in a clutter. We then waited close by and watched the general public either walk by or pick up the coins and take notes on the way they did it.

○Our hypothesis was correct, but at the same time incorrect. We thought that the people would just pick up the the nickel, but when they did pick up the coins, they picked up all of them.

○If we did this experiment again it would be best if we controlled some of the variables. We could of done this by watching the color of the surface we put the coins on , and the oldness or the newness of the coins. Also the age of the people who picked them up.

○We conclude that if no one is surveying yes, some people will pick up a herd of coins on the ground. Also we observed that most of the people who picked up the coins were men.

NAME(s) Vincent Moeykens, Benjamin Meagher

PROJECT NUMBER GP16

SCHOOL Windsor Jr/Sr High School

GRADE 7

TEACHER Jennifer Townsend

PROJECT TITLE **Laser Amplification Modulation**

ABSTRACT

The basis for our experiment was to find a better and more efficient way of transmitting and receiving sound. We built a amplification modulator that lets us transmit audio over a carrier beam, in our case, a laser. We then built a receiver using a photocell. Our question was, ôWhat method is better for transmitting and receiving audio? Audio over a modulated laser beam, or, over a Radio Frequency in the form of a walkie talkie.ö We tested our transmitters and receivers in three categories, range (without obstructions), current of electricity through receiver, and what elements could it pass through. When testing the range of the device the radio won, going about 1.4 miles, where the laser only went approximately 500 feet. For testing the electricity we tested the current usage through the receiver of the laser and radio using a multimeter. In that category the laser won using about 10 times less amps than the radio. Finally, in the category elements we tested what elements the radio waves and the laser beam could go through, solid, liquid, gas, or all three. The radio successfully went through all three elements without a problem. But the laser beam only could go through air and went through the liquid only about 50% of the time. It could not go through a solid. In the category elements, the radio won. Overall, the radio won in two of the three testings. Finally, to further expand our experiment, we asked, ôHow can we improve the laser transmitter and receiver?ö

NAME(s) **Abigail Monahan**

PROJECT NUMBER **C14**

SCHOOL Saint Francis Xavier

GRADE 6

TEACHER Mary Ellen Varhue

PROJECT TITLE **Detergent Wars!**

ABSTRACT

○This experiment investigated how well a detergent lowers surface tension, thus making it a better detergent. Detergent is something used everyday, and its effectiveness is useful to know. If you donÆt clean your dishes thoroughly you will have to wash them again, using additional detergent and water.

In this project I tested how different kinds of dish soap affect surface tension. I hypothesized that Dawn Ultra dish detergent would need the least drops of water to pull the needle out of the water detergent mixture.

The procedure is to fill one cup with 50 mL of water and 1 mL of detergent, and stir the mixture so it's combined. Place the needle so it is floating on top of the water. If you look closely you will see the water slightly curving upward, because the surface tension of water is pulling back on it. On the other side of the beam structure there is a cup hanging from the straw. In the cup drop drops of water with an eyedropper. Be sure not to bump your workspace or exhale onto your needle because these are variables that could pull the needle out of the water.

Ultra Palmolive Oxy Power Degreaser, Seventh Generation Natural Dish Liquid, and Dawn Ultra with Olay Beauty Hand
Renewal lowered the surface tension of water the best with an average of 1.2 drops of water to pull the needle out of the water dish detergent mixture.

In conclusion, I disapproved my hypothesis. Dawn Ultra took the most drops of water to pull the needle out of the water, thus making its ability to lower surface tension the worst.

NAME(s) **Jamie Moore**

PROJECT NUMBER **B16**

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE

ABSTRACT

I am studying the problem of butternut canker disease. This is a fungal infection unique to butternut trees that causes a growing canker sore that contributes to the treeÆs early demise.
There is a stand of butternut trees in Charlotte that has a number of healthy trees plus many diseased trees. I plan to use a GPS unit to map all the trees and label them. I will also take some health attribute data from the trees regarding the level of progression of the disease, their age (via the diameter of their base), Number of cankers on the main stem and on the root flare, branch dieback, and live crown ratio. Numerical data will be derived from the attribute data. Then I will compare those data with similar data from the studies of Dr. Bergdhal on butternut trees in other areas of Vermont as well as other areas of New England and New York.
I hypothesize that the likelihood of disease will correlate to the age of the tree due to the greater time available for contamination that diseased trees will be closer in proximity to other diseased trees and likewise for healthy trees. I also hypothesize that healthy there will be a correlation between the age of the tree and its likelihood of having the disease, as well as the severity of the disease.
Data collection is incomplete however, it is expected that my hypotheses are supported by the data of this lab. My research will add to a growing amount of research of butternut canker disease and will bring scientists such closer to a fuller understanding of butternut canker disease.

NAME(s) Olivia Morana
PROJECT NUMBER C15
SCHOOL St. Mary's School
GRADE 6
TEACHER Mrs. Eagan

PROJECT TITLE **Veni, Vedi, Verdigris - I came, I saw, I oxidized!**

ABSTRACT

Pennies are made out of copper and zinc. Over time they can become oxidized, causing them to turn dull green, brown or blue. The coating is called Verdigris. You may have seen verdigris on famous landmarks like the Statue of Liberty or other objects made of copper. Oxidation is when the copper in the pennies react with the oxygen in the air to form copper oxide. Acids are able to dissolve copper oxide and remove it, leaving the pennies shiny again. The acid solutions I used were vinengar which contains acetic acid, and lemon juice which contains citric acid and ascorbic acid (also known as Vitamin C). Many foods and household items contain acids. Examples are Aspirin which contains acetylsalicylic acid, and cola sodas which have phosphoric acid. Once the pennies are cleaned, the copper oxide is now dissolved in the solution. By placing a nail made of steel, some of the copper oxide can be collected again! When a steel nail is soaked in the acid solution, small bubbles of hydrogen gas are released because of a chemical reaction between the acid and the copper oxide. Clean pennies can also be oxidized very quickly if they are left out in the air, especially if they are not rinsed after soaking in acid solution. Clean pennies will not oxidize as quickly if they are rinsed with clean water and dried after soaking in the acid solution. In this project I will test how quickly various household items can remove the verdigris from pennies and I will demonstrate how to coat steel nails and clean pennies with copper oxide.

NAME(s) Caleb Morehouse
PROJECT NUMBER G21
SCHOOL The Renaissance School
GRADE 7
TEACHER Caryn Shield

PROJECT TITLE **The Most Effective Grass for Biomass Energy**

ABSTRACT

This experiment was designed to answer the question, how does the type of grass affect its use in biomass energy? To do this I grew plants for a period of four weeks and after washing and drying them, burned them in a homemade water heater assuming the change in temperature would measure their effectiveness in a real biomass generator. I used thirty seeds of each plant and tested corn, wheat, oat, switchgrass, and a mixture of grasses used often in lawn and called Perennial Ryegrass. I also used three trials of each grass. I found in my results that corn was the most useful because it produced a five degrees Celsius increase in water temperature. The second most increase was three degrees Celsius. Corn also was the heaviest mass for thirty seeds, at 30.63 grams.

I can conclude from this data that corn was the most effective at heating water. However, there is a problem: not all biomass generators use raw plants. Many use ethanol made with plants, and some plants that are good when burned raw are not as effective when burned as ethanol. However, heavier plants produce more ethanol and as shown in my data, corn was the heaviest, meaning that regardless of its form within the generator, corn is the most effective grass for biomass energy.

NAME(s) Basundhara Mukherjee
PROJECT NUMBER B17
SCHOOL South Burlington High School
GRADE 11
TEACHER Curtis Belton

PROJECT TITLE **The Effects of Aluminum Sulfate on the Aquatic Species Ceriodaphnia dubia**

ABSTRACT

This study provides a comprehensive analysis of the effects of various aluminum sulfate (alum) concentrations on the aquatic species Ceriodaphnia dubia (daphnids). The state of Vermont currently employs alum to control phosphorus amounts to prevent consequent algal growths, which are detrimental for aquatic species. However, it is also necessary to test the impacts of alum on daphnids, as they are critical to the aquatic food chain. It is hypothesized that lower percentages of alum will result in the highest survival rates.

The experimentation stage consisted of seven groups, each with four individual containers. The two control groups contained no alum, while the five experimental groups contained various alum concentrations, ranging from 0.00005 to 0.008 percent solutions. The controlled variables, which were tested before and after experimentation to discern any changes, were temperature, dissolved oxygen, pH, and number of daphnids. Each container initially comprised five daphnids; after the 48-hour acute toxicity tests, survival rate of the daphnids for each group was determined.

Experimentation shows that higher alum concentrations engender greater mortality among the daphnids; 0.0002 to 0.00005 percent solutions result in the highest survival rates (>50%). The data will be initially be analyzed by a correlation test between the values for percent survival and percent alum. Furthermore, qualitative analysis will be used to discover any significant effects of the alum on the daphnids. Finally, the analysis will observe relevance of the results to the holistic aquatic community, and conclude the benefits and drawbacks of alum usage.

NAME(s) Emma Murray-Clausen, Kelsey Golonka
PROJECT NUMBER GP07
SCHOOL Main Street Middle School
GRADE 8
TEACHER Amy Kimball

PROJECT TITLE **Undercover Bacteria**

ABSTRACT

Many different factors affect the growth of bacteria. Different temperature (environments) is one of that changes the behavior of that growth. This experiment is tested to see how temperature differences affect the growth of bacteria. Our hypothesis is that the colder the environment, the less bacteria will grow. In this test, we had three different stations which were different temperatures: room temperature station (62F), under a light (65F), and in the fridge (38F). We got the bacteria from three different subjects: the mouth (saliva), from petting a cat, and a doorknob. These dishes were placed in their environments for 3 days and were observed everyday. The agar dishes with bacteria from the saliva, catÆs fur, and doorknob placed in the fridge had no growth of bacteria. However, the bacteria under the light grew the most. In addition, after the three days the bacteria growth showed the doorknob had the most bacteria. Overall, from the results collected, we can conclude that a colder climate slows down the growth of bacteria. Also, we learned that bacteria is everywhere and to stay healthy you should clean objects where bacteria is collected the most and you should wash your hands regularly.

NAME(s) **Patel Neerja**

PROJECT NUMBER **G22**

SCHOOL South Burlington High School

GRADE **10**

TEACHER Curtis Belton

PROJECT TITLE **Disinfecting Water Using Clay**

ABSTRACT

The purpose of this experiment was to find the best and most efficient way to filter water using clay. One of the experiments is to make clay pots using plastic plots to slowly filter out the water while the other experiment is the heating of clay to filter water. The clay will be made from natural materials. Using organic materials will accommodate people all around the world because they are found is most places. In both experiments, the water is being self-contaminated by the experimenter. Using both filters will determine which is better. Following up on this includes using different waters from various bodies of water around Vermont to see if each filter indeed works to filter out the water.

The control of this experiment will be clean drinking water. This water is being observed using a microscope to find what is found in clean drinking water. While conducting the experiment, one will hypothesize that the heating of the clay would work better as a water filter due to the sterilization of bacteria in the water instead of just releasing the bacterium.

The experiment is not finished at the moment, but will continue to be experimented with and many trials will be done.

Clay filters can be highly effective in many developing countries mostly due to the small amount of efficient resources needed in order to build them and time needed.

NAME(s) **Chris Neimeth**

PROJECT NUMBER **P21**

SCHOOL Mater Christi School

GRADE **7**

TEACHER Mark Pendergrass

PROJECT TITLE **Are you snowboarding as fast as you really can?**

ABSTRACT

The project is about snowboarding. The question that the project tries to answer is: what is the fastest way to ride a snowboard? After doing some background research the tester learned friction increases when there is more mass. Another thing one learned is sliding friction is the type of friction that affects the project. The hypothesis was if someone was in the lowest position they would go the fastest because the lowest position would have the least wind resistance. The tester performed the project by following this procedure. First they measured the length of one pace (which was an average of two feet) and then they measured roughly 160 feet. After that they walked up the hill put, on the snowboard and waited for the timer to say go and start the timing. Each time they went down they had to go down sitting, crouching or standing. Then they went down, they looked at the time and recorded the time on a slip of paper. After testing they converted all times into a speed in feet per second. An issue that the tester ran into while testing was falling; the tester fell many times. This meant the tester had to retest many times. After the testing was completed he discovered that his hypothesis was incorrect; crouching was the fastest not sitting. The tester thought crouching was fastest because it was hard to turn quickly while sitting but, it was very easy to turn quickly while in a couched position.

NAME(s) Annie Nelson
PROJECT NUMBER S17
SCHOOL Windsor High School
GRADE 11
TEACHER Jennifer Townsend

PROJECT TITLE **How does the concept of interference help explain the Stroop Effect**

ABSTRACT

The purpose of this experiment was to find out if interference had an effect on the stroop effect. The stroop effect is the demonstration of the reaction time of a task. I wanted to know if a person's reaction time would change if there were added variables when doing a task. The added variables was the interference l was looking for. The first thing l did was make and put together ten different tests with four different sequences. All of the tests had the same information, but it was in different orders. This was because I didn't want one person to listen to someone elseÆs test and memorize part of it, thatÆs not the point of my experiment. The four sequences were shapes, shapes with matching names on top, shapes with non-matching names on top, and just the shapes names. A total of 34 people took my test and this also proved that interference does in fact play a role. The test with the fastest average was the shape words alone which was 3.82 seconds. This was the fastest for one obvious reason, reading has become so automatic that its not really reading, we see the word and recognize what it was so fast that we don't have to read. Of course this is mostly with words that we have seen hundreds of times. The test with matching words and shapes averaged 3.93 seconds, there was some interference just by there being two like variables. The slowest of course was shapes with non matching words, it averaged 6.99 seconds. This was the negative interference, it was also the test that was supposed to make your brain work.

NAME(s) Jaime Nolan, Rachel Meagher
PROJECT NUMBER GP01
SCHOOL Windsor High School
GRADE 12
TEACHER Jennifer Townsend

PROJECT TITLE **Are fingerprints inherited?**

ABSTRACT

The purpose of this project was to examine what affects the creation of fingerprints. Originally, the project was designed to compare the fingerprints of family members to one another to determine if there was any correlation. Correlations between would help to support the original hypothesis that fingerprints are inherited from parents. It was quickly found that were too many variables in this experiment, therefore leaving the data inconclusive.

As the process of this project progressed a new question was developed: Do fingerprints of the same person have any correlation between fingers? The experiment was then expanded to examine this question. A hypothesis that fingerprints do not have any correlation between them was formed. The data collected displayed that fingers mirror each other, for example, the left and right pinky prints mirror each other. There is little correlation between different fingers, such as the index to the middle finger, however. The more the fingerprints analyzed, the more questions came to mind.

Conclusions from the other parts of this project led to the idea that fingerprints are affected by the environment in which they are created. Fingerprints of sets of both identical and fraternal twins and their respective biological parents were collected and analyzed. The data supported previous conclusions from this experiment. Some correlation was found between twins.

The creation of fingerprints continue to marvel scientists brains. This project have shown insight to the complicated process of fingerprint analyzation.

NAME(s) Keegan O'Hara
PROJECT NUMBER G23
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Water Quality of Different Parts of Lake Champlain**

ABSTRACT

The purpose of my experiment is to determine which section of Lake Champlain, the Inland Sea, Mallets Bay, or the Broad Lake has the best water quality. The hypothesis is that the Broad Lake will have the best water quality because it is far more oligotrophic than Mallets Bay and a bit more than the Inland Sea.
Water quality will be determined by the water quality index, which consists of a series of tests, the results being put into an equation to find the WQI number. The tests are on temperature, ph, biological oxygen demand, dissolved oxygen, nitrates, fecal coliform, total dissolved solids, turbidity, and total phosphates. In the study you will conduct each of these tests at the same time, during the winter, to ensure that there is no data difference because of that. For the ph, BOD, and DO tests the study calls for a Vernier test probe, which is a very precise way of taking measurements.
Controlling this experiment will be difficult, because the temperature in the winter is just a few degrees above zero Celsius, and some of the testing equipment can only be done at school, and in the process of transporting it to school the temperature changes, and this temperature change can affect the quality of the experiment.
This experiment is being conducted because I live in South Hero, and knowing which section of the lake is cleanest is important for me because I spend a lot of time near or in the lake.

NAME(s) Erin ODonnell, Maryann Pohlen
PROJECT NUMBER GP26
SCHOOL Christ The King Burlington
GRADE 7
TEACHER Mrs. Vidula Srivastava

PROJECT TITLE **Package Power**

ABSTRACT

How influential is the packaging of a product? Companies spend millions of dollars every year marketing to children alone. The purpose of this experiment was to see if the packaging of breakfast cereal influences a childÆs choices and tastes in the product. We hypothesized that if kindergarten children were given their choice of the same cereal, one in a box with cartoon packaging, and another box with generic packaging, that the children would visually prefer the cereal in the cartoon packaging, however they would think that cereal tastes the same.

To begin our experiment, we used two cereals, Total and Cheerios, and made two fake boxes for each of them: a cartoon box and a generic one. The Cheerios were renamed Monkey OÆs and the Total was renamed Elephant Ears. We then brought seven kindergarten children into a room one by one and set the two boxes in front of them. They were asked which cereal they thought would taste better. Next, we gave them a sample of the cereal they chose and recorded the results using a survey sheet. We did the same procedure with the next cereal.

We found that the children were influenced by the cartoon packaging over the generic packaging, but the results were not as drastic as we expected. In both the visual and tastes tests, three children chose the generic cereal and four children chose the cartoon cereal. What is particularly interesting though, is that some of the children who initially chose the generic cereal based on the packaging, when given the chance to try both cereals, thought that the cereal in the box with colorful packaging tasted better even though it was the same cereal in both boxes. This suggests that marketing can indeed sway a child's choices in food.

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

PROJECT TITLE **The Relationship Between Fingernail Growth and Nutrition or Age**

ABSTRACT

The purpose of this experiment was to find how the difference in nutrition taken and other factors such as age affects to the growth of fingernails. There were eight people who could volunteer to record foods they had eaten, and measure their fingernail lengths for a month. In conducting this experiment, it was hypothesized that more dietary food a person took, the quicker the fingernails will grow, when vitamin supplement was taken, rates of the growth of fingernails will increase but not abruptly, and within the subgroups, teenage male will represent the highest rate of the growth of fingernails than others.

The control group of this experiment was consisted of people before taking vitamin supplement. The dependent variable was the vitamin supplement while the independent variable was rate of the growth of fingernails. After the second week of the experiment, people who had slower growth of fingernails took vitamin supplement to try facilitating it. Those people kept taking vitamin supplement for rest of the month.

From the data of measurement of fingernails, it could be said that before vitamin supplement was taken, there is not much difference in rate of growth of fingernails, but those who took vitamin supplement for last two weeks got quicker growth of fingernails than the first two weeks. Also through the experiment, male had quicker rate of growth of fingernails than female. Later, the data will be analyzed more about the nutrition in foods people took.

NAME(s) Caleb Oliveira
PROJECT NUMBER G24
SCHOOL The Renaissance School
GRADE 6
TEACHER Caryn Shield

PROJECT TITLE **Renewable Energy Powered Water Filtration**

ABSTRACT

My question is, can a completely renewable energy powered water filter be made, and reduce the amount of phosphorus, debris, trash, oil, and nitrates in the water. To reduce phosphorus in the water I made a biochar filter, and to reduce the trash, debris, and oil I made a simple filter with cotton balls. To replicate the phosphorus and nitrates I put fertilizer into the water. Then I put in dirt, trash, and olive oil into the water and ran the filter with a solar panel and a constructed wind turbine.

My hypothesis was that the renewable energy powered water filter could be made and it would filter the phosphorus and trash significantly because of all the biochar, which has fibers that absorb phosphorus. I hypothesized that the trash would be too big to go through the cotton balls and therefore be filtered out. I thought that the filter would take the dirt and oil out also because those particles would have a hard time getting through the cotton balls. I hypothesized that the filter would work less well taking out nitrates, because biochar works better filtering phosphorus.

I used a water testing kit to compare nitrates and phosphorus levels before and after filtering, and my results showed that much of the trash, debris, oil, and nitrates were filtered out, along with a significant amount of phosphorus.

NAME(s) Alexander Pasanen
PROJECT NUMBER G25
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Effect of Roofing Material on Water Quality**

ABSTRACT

The purpose of this experiment is to determine how different roofing materials affect runoff water quality. The three roofing materials will be aluminum, cedar shingles, and asphalt shingles. The samples from these materials will be compared with rainwater collected directly from the clouds. Testing will be done on the levels of: phosphorus, nitrogen, potassium, zinc, lead, iron, copper, total petroleum hydrocarbons, and pH. It is hypothesized that the asphalt shingles will cause the most change in water quality, then cedar shingles, and aluminum roofing will have the smallest effect.

The control group in this experiment is the rainwater collected straight from the sky. The experimental group consists of the three different runoff samples collected from the roofing materials. The independent variable in this experiment is the type of roofing because that is the difference between the control and experimental groups. There are many dependent variables, which are affected by the roofing materials, and they are all of the things that are being testing for in the water.

The data collection has not been completed for this experiment and the hypothesis will either be supported or contradicted. The data will be analyzed and applied to a real life situation by determining whether or not the change in water quality would affect how the water could be used on plants if the plants were going to become food.

The final analysis will help people understand how safe it is to use roof runoff water to grow plants that they plan on consuming.

NAME(s) Sasha Pearson
PROJECT NUMBER B37
SCHOOL Hinesburg Community School
GRADE 7
TEACHER Stephanie Konowicz

PROJECT TITLE **The Egregious Earbuds**

ABSTRACT

Hearing loss in teenagers is growing, and may be occurring because of increased use of earbuds to listen to music at high volumes. In my project, 23 junior high school students from Hinesburg Community School and Lake Champlain Waldorf School were questioned about their use of earbuds to listen to music, and tested on their ability to hear some of the sounds that disappear first when hearing is damaged. Testing took place using the Siemans Hearing Test app for iPhone, and students were tested in a quiet room immediately after filling out a written questionnaire on their earbud listening habits.

Student hearing scores ranged from 3 to 16, with 18 being a perfect score (all sounds heard in both ears). The students who reported they listened most often with earbuds, and had been using them longer, had worse hearing than those who seldom used earbuds. The most important factor in their hearing loss was how many days a week they used earbuds, and students who listened every day had the worst hearing. Kids who listened once a week or less had an average raw hearing score of 13.8, those who listened two-three times a week had an average of 10.6, and those who listened daily had an average hearing score of 8.8. If junior high school students using earbuds already are showing some hearing loss, it is important we understand the danger and try to use earbuds less or even not at all to listen to music.

NAME(s) Gailin Pease

PROJECT NUMBER B18

SCHOOL Burlington High School

GRADE 11

TEACHER

PROJECT TITLE **The Effect of Biodegradation products on Plant Germination and Growth**

ABSTRACT

The effect of biodegradation products on the growth of rice were studied. The fungus Aspergillus niger has been shown to degrade polyester polyurethanes by breaking ester bonds, and is able to use polyesters as its sole carbon source, making it ideal for isolating the effects of biodegraded plastic. It was hypothesized that the addition of polyester polyurethane alone to rice plantings would harm germination and growth, and that the harm to growth from biodegraded plastics would be even greater due to the toxins released in the biodegradation process and the alkaline soil produced. Finally, studies of Aspergillus niger as a plant pathogen suggested that the fungus itself would further impede plant growth by attacking the seedlings. A culture of Aspergillus niger, obtained from the FGSC, was grown in potato dextrose broth, then removed and centrifuged to remove traces of the broth. The fungus was then moved into Impranil DLN, a polyester polyurethane dispersion in water. Fungal growth occurred slower than expected, causing delays in research completion. After biodegradation is completed, as indicated by clearing of the Impranil DLN, four rice plantings will be prepared with 300 mL of experimental material added to the water. One will contain 300 mL of Impranil DLN with no fungal degradation, one will contain 300 mL of biodegraded Impranil DLN, one will contain 300 mL of heat treated biodegraded Impranil DLN to kill the Aspergillus niger, and the last will contain 300 mL of water. Germination rates and seedling health will be measured to determine the effect of biodegraded plastic.

NAME(s) Christopher Petrillo

PROJECT NUMBER B46

SCHOOL Champlain Valley Union High School

GRADE 12

TEACHER Dr. Nancy Elwess

PROJECT TITLE **Testing Frogs from the Lake Champlain Basin for the Presence of the Chytrid Fungus and Ana**

ABSTRACT

Established infectious diseases are possible factors in the decline of amphibian populations internationally. The Batrachochytrium dendrobatidis (Bd), or Chytrid, fungus has been recognized as a specific killer of wetland inhabitants since being discovered in the late 1990Æs. The pathogen causes amphibian mortality by thickening the top layers of skin and disrupting the natural cycles of respiration and water intake, eventually leading to cardiac arrest. In order to examine the fungus further in localized areas, water samples were collected from immediate tributaries and ponds within the Lake Champlain Basin. From these water samples, environmental DNA (eDNA) was isolated and tested for the presence of the Chytrid fungus as well as other important environmental pathogens. If this fungus is found, it could have serious environmental consequences. Properly identifying the pathogen in the area, allows for faster assessment and treatment of affected zones. It has been known for some time that amphibian populations have been declining in The Lake Champlain Basin. Through proper data collection and analyses, more complete records of either the fungus or the frog population as a whole may be added to existing knowledge and archives. The researcher found inconclusive evidence for the presence of the fungus. However, other organisms were found including Botryotinia fuckeliana, Noble Rot Fungus, and a potentially new species of nematode in the genus Hoplolaimus. Both of these organisms are classified as pathogenic to fruit and vegetable crops and trees (Including Maple) as well as corn respectively. In addition, frogs were captured and released in order to collect DNA samples with Buccal swabs. This allowed for the establishment of a frog DNA database within the Lake Champlain Basin using the mitochondrial Cytrochome B gene. This new information may hold significance in the near future to deal with larger environmental concerns in the Lake Champlain region.

NAME(s) Courtney Peyko
PROJECT NUMBER B47
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Dog Behavior: Decoded**

ABSTRACT

The purpose of this experiment was to learn the true intelligence of canines by studying their behavior. After researching various behaviors of dogs, five tests were designed to determine how the mind of a dog processes information.

It was hypothesized that smaller breeds of dogs are more intelligent than larger breed dogs. The control in this investigation is small dogs while the experimental is large dogs. The independent variable is the type of dog breed which will affect the dependent variable: the outcomes to each procedure.

Data collection, at this point, is unfinished. The results in the end would now be able to answer these questions: Does a dog realize an object still exists even when they canÆt see it or that a solid object canÆt fall through another? Can a dog figure out how to get around or move an obstacle to retrieve a desired object? Can a dogÆs brain follow and respond to a number of verbal commands and vocalizations?

By the end of the inquiry, there will be a final count of around 50 to 100 dogs. The final analysis will consist of a large comparison from one breed to the next. It will show a large chart of dogs as well as average scores for each procedure, and an inquiry showing what the hardest task was for each dog to complete.

By the end of this lab, the results could give humans a better understanding of their canine companions.

NAME(s) Jake Ploof
PROJECT NUMBER B19
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Effect of Worms on Plant Growth**

ABSTRACT

The purpose of this lab is to determine whether worms have a significant effect on the growth of plants. Canadian night crawlers will be used to determine this. The type of plant used for this experiment will be winter wheat.

- The control group of this experiment consists of a somewhat deep tray of winter wheat plants. The experimental group will consist of the same amount of plants in the same kind of tray, but will be separated from the control set. The only difference is that the experimental set of winter wheat plants will have around eight Canadian night crawlers living in their soil. The two plant sets will be watered equally and will live under the same light conditions as each other. Throughout the experiment, plant height will be measured every Friday. This data will be put together at the end of the experiment. The experiment will continue until the wheat grows heads. Once the experimenting is finished, the plant biomass will be measured and compared for both variables.
- This experiment, when finished, should provide a more accurate understanding of the effects of worm productivity on plant growth. This will be determined by comparing plant height over time and by comparing the plant biomasses once the experimenting is finished. I predict that the plants that have worms in their soil will grow to be taller than the plants without worms in their soil and will have a higher biomass. This is a summary of the experiment.

NAME(s) Olivia Pockette
PROJECT NUMBER C16
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **The Effects of Soda on Tooth Enamel**

ABSTRACT

This experiment is testing soda and how it affects the enamel on a tooth. I chose this project because many of my friends and family drink soda. I was interested in what it did to one's teeth and what ingredients did the most damage. To do this experiment, i had to boil and scrub all of the baby teeth to get them clean. I separated the twelve teeth into three groups based on size and put them in closed containers where they would not be touched. Then, I added one tablespoon of soda into each container. I used four different types of soda. I had three different size teeth in each type of soda.Everynight i drained the soda from the container, observed the teeth, took pictures, rinsed the teeth in cold water and then added new soda to each container. Group one was in the soda for four days, group two was in the soda for eight days, and group three was in the soda for twelve days. The results of this experiment showed that Coca Cola did the most amount of damage, eroding the enamel in one day, and Root Beer did the least amount of damage, the enamel was still intact after twelve days. Mountain Dew and Orange Crush did a reasonable amount of damage to the enamel on the teeth. The started to erode the enamel in seven days. This experiment allows me to sspread the word about the harsh ingredients in soft drinks and how the can affect one's teeth.

NAME(s) Frederick Pohlen
PROJECT NUMBER P22
SCHOOL St. Mary's School
GRADE 5
TEACHER Mr. Hill

PROJECT TITLE **The Sky is Falling! Predicting the Size of Craters**

ABSTRACT

Have you ever seen any of the giant craters on Earth or another planet or moon and wondered what size meteorite must have created it? This project explores the relationship between the size of objects and the size of their impact craters. I hypothesized that if you know the size of an object, then you can predict the size of the impact crater that it will create. Objects of different sizes were dropped from two different heights into a pan of flour, three different times. The resulting craters were measured and those measurements were compared to the original diameter of the object. I then figured out the percentage of the crater versus the diameter of the original object. I averaged the percentages and used that information to see if I could predict the size of a crater using a 5th object. The results supported my hypothesis. I was able to predict the size of the crater within 1/10th of the actuala size. This is important because if we were to see a near Earth object in space, we could measure it and predict if its impact would be a threat to Earth in any way.

NAME(s) Simeon Pol
PROJECT NUMBER P23
SCHOOL Rutland High School
GRADE 11
TEACHER Deborah Rodolfy
PROJECT TITLE **Torque**

ABSTRACT

This experimentÆs purpose is to find out how to create more angular velocity aka speed when spinning. Every time you spin or twist you are creating small amounts of torque with your body. Some people use more amounts of torque to spin fast and perform tricks in some sports like figure skating, skiing, snowboarding, or gymnastics. Torque is the moment of force or the tendency of a force to rotate an object about an axis. Fundamental maneuvers created by torque are spins and flips. My experiment will focus on how to create more torque by including factors like counter rotation which is a twisting of the body in the opposite direction of the intended spin. My question answered from my findings in my experiment was that if the amount of counter rotation increased the torque would be greater when spinning. To answer this question I did my experiment. I had a test subject do 10 trials of spins on a trampoline with variables in mind and taken care of and I filmed the back of the subject to see the amount of counter rotation was used for each trick. The angles of each trial spin were recorded. From my observations in the video to the matching data, counter rotation was able to increase the amount of force, but factors like the subjects form while spinning wasnÆt perfect in the higher torque recorded trials causing less of a spun angle. The greatest distance trial was observed to have less counter rotation but more distance of a spin because of the form of my subject was more together in a cylindrical fiqure. This information can also help with improving competition in competitive sports that involve spinning and flipping as well as move forward towards how fast a human can actually spin.

NAME(s) Oliver Pomazi
PROJECT NUMBER B20
SCHOOL Brattleboro Union High School
GRADE 11
TEACHER Matt Betz
PROJECT TITLE **Knotweed Removal**

ABSTRACT

My research consisted of three field research projects: One conducted outdoors during the growing season, and two indoors over the winter. Outdoor testing was aimed at finding a cheap, simple eradication method for established groups of Knotweed. I separated two groups of knotweed, each one yard square, and cut one group two to four inches from the ground, digging the other up as effectively as possible. I then recorded the returning growth rate of each plant. The indoor testing examined another method of eradication; shrouding the plants in a tarp to limit sunlight. Two additional research projects were done as well. One of these was a preparation of a basic information sheet containing information on japanese knotweed. The other was a fifteen page paper on the spread of several invasive species in New England.

○From my field and indirect research, I drew several interesting and useful conclusions about the growth and control of invasive species, including Japanese Knotweed. I am able to derive the same conclusion from my field and research; I concluded that invasive species are better able to recuperate if the ground is disturbed. In my field research this was apparent because the plants that were dug up grew back faster than those that were cut. I concluded that shoveling or tilling most invasive species leads only to faster re-growth. This conclusion is supported by several credible sources, and by my field research. Also, I found that if knotweed is cut before the end of the summer season when they flower, it is possible to prevent flowering and therefore eliminate one method the plant uses to spread. These conclusions can be put to use controlling many invasive species, in various affected areas.

NAME(s) Declan Quinlan
PROJECT NUMBER S18
SCHOOL South Burlington Highschool
GRADE
TEACHER Curtis Belton

PROJECT TITLE **Music and Dementia**

ABSTRACT

The purpose of this lab is to determine whether music has a significant effect on a brain with dementia. Gaser and Schlaug (2003) already showed that music has a significant effect on the mind of a person without the disorder, so it is hypothesized that there will be a similar effect on a person with it.
The control group consists of a group of people (age random), that perform a simple cognitive brain test. This is compared to the experimental group of people with dementia that perform the same or similar test. There will be both one-on-one observation and group observation for this experiment.
Data collection is incomplete, but it is expected that the experimental group will show a change in their behavior and cognitive functions while listening to music and while not listening. While there will be many variables involved here, since the experiment deals directly with people, data analysis will rule out certain variables, or as many as possible.
New discoveries in the area of music on a dementia mind could help to lead new therapies for the disorder. There is no cure to dementia currently.

NAME(s) Elijah Rachlin
PROJECT NUMBER C17
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Differences in Efficiencies of Biofuels**

ABSTRACT

The purpose of this experiment was to determine the efficiencies of different biofuels in order to find which type of fuel would be most effective in the conversion combusted materials into electricity. In this experiment, it was hypothesized that energy crops like switchgrass, which is grown specifically for biomass consumption, would give off the most energy when combusted.

The control group in this experiment consists of a predetermined amount of biofuel that is combusted, and the amount of energy given off is measured by a calorimeter. The dependent variables are performing the same experiment with the same amount of different possible biofuels, such as sawdust, bark, logging byproducts, and dried sewage waste.

Data collection is not yet completed; however, as the hypothesis states, the control group of switchgrass is expected to produce energy more efficiently than the other options. The analysis will also give suggestions of the best actions to take for biomass producers depending on the most efficient biofuel compared with the abundance of each resource. It is also the intention of the experimenter put the data given by the calorimeter into a formula to calculate the possible potential electricity for each biofuel. With that data, a suggestion can also be made about choosing the right renewable energy source for electricity in different areas around the world.

NAME(s) Kaleb Radford
PROJECT NUMBER P24
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Wind Car**

ABSTRACT

The purpose of this experiment was to evaluate the energy produced from a small wind turbine mounted in the grill of a car and compare the loss of gas mileage from the turbine as a result of additional air resistance to energy produced. It is hypothesized that the energy created from this turbine will recharge the battery a Toyota Prius enough to compensate for the reduced gas mileage.

The control group data in this experiment was collected by driving a car around for a month. When the vehicle was refueled, the miles driven and the total gallons of gasoline put into the car were recorded.

The experimental group data is still being collected. The experimental group was conducted the same as the controlled group with the exception that a wind turbine was mounted in the grill of the car and the energy produced from the wind turbine was recorded. The car and the person driving it were the same, and the total miles driven for the experimental and controlled group will be very similar.

If the wind turbine does create enough energy to overcompensate for its loss of gas mileage, it theoretically is probable that the miles per gallon that the Toyota Prius, and all electric cars, can acquire will greatly increase and a decrease in the electricity consumed to charge the batteries will also be observed.

NAME(s) Vignesh Rajendran
PROJECT NUMBER C18
SCHOOL Essex High School
GRADE 10
TEACHER Maria Ung

PROJECT TITLE **Designing and Optimizing a Cost-Effective Model for Lipid Extraction from Algae**

ABSTRACT

The purpose of this project was to see whether introducing conditions to an algae sample would increase electrolytic flocculation, resulting in a reaction that increases the rupture of algal cell walls in order to release optimum amounts of lipid. Electrolytic flocculationÆs necessary conditions were introduced through DC voltage biasing, duration of biasing, type of electrode, and the distance between the electrodes in the algal sample. Each sample of algae was introduced to a combination of the aforementioned conditions based on the hypotheses as well as a constant light source. After the experiment is conducted, the algae sample will be viewed under a microscope to study the effects of electrolytic flocculation based on the cell count of ruptured algae cells. As hypothesized, preliminary tests have shown that introducing higher DC voltage resulted in higher levels of reaction within the algal sample. In the next stage, the optimum DC voltage will be tested with varied durations of biasing to test for the optimum combination of both. In the stages after that, the optimum combinations from DC voltage and duration of experiment will be tested with the variable electrode type to test for the optimum combination of these conditions. This process is then repeated to test for the best combination of these four conditions based on their lipid output. Finally, a 'formula' will be created for optimum conditions for lipid extraction. Conclusions leading to the final optimized conditions combination are yet to be made based on pending results.

NAME(s) **Miles Rapaport**

PROJECT NUMBER **S19**

SCHOOL Main Street Middle School

GRADE **8**

TEACHER Eli Rosenberg

PROJECT TITLE **Does Positive or Negative Reinforcement Affect Performance?**

ABSTRACT

While watching the olympics this past summer it was evident that athletes who looked more stressed did not do as well in their events. The purpose of my experiment wa I wanted to evaluate the effects of positive thinking versus negative thinking on performance. I thought that positive thinking would increase performance ability and that negative thinking would decrease it.

During my procedure I asked seven positive and seven negative questions that were about the same thing but phrased differently (see figure 1). First I asked my 14 test subjects the positive questions and then I had them throw three darts at a target. The darts were identical and they were thrown from the same distance away from the target. The next day I asks them the negative questions and had them throw the darts the same way as the day before. Both days I recorded the data in my data chart (see figure 2). Once I tested everyone I circled the ones whose scores stayed the same but made a checkmark next to the ones whose scores improved during positive testing, and put an X next to the one that improve during negative testing.

My results indicate that positive thinking may in fact improve performance ability for most. The data shows that 2 out of 14 people had data that stayed constant; 4 out of 14 people had data that showed improvement during negative testing; and 8 out of 14 people had data that show improvement during positive testing.

NAME(s) **Harpreet Rattu**

PROJECT NUMBER **B21**

SCHOOL South Burlington High School

GRADE **10**

TEACHER Curtis Belton

PROJECT TITLE **Manipulation of Algae Lipid Composition to Provide an Alternate Source for Biofuel**

ABSTRACT

The purpose of this experiment was to determine the condition for algae to yield optimum lipid production through experimental variations of light intensity and nutrient levels. Roxanne Beltran and Beth Jacobs of California proposed a similar experiment but concluded that the local algae used were inefficient and proposed another type of algae be used. Prior to the execution of this experiment, it is hypothesized that high lipid algae strains such as Chlorella or Botryococcus braunii, will enhance upon being exposed to high variations of the two abiotic factors.

The control group in this experiment will consist of a high lipid algae strain placed under natural conditions for both abiotic factors. Throughout the duration of experimentation, the algaeÆs cell and lipid content will be recorded along with the optical density. The independent variable is the varying gradients for each abiotic factor from which the lipid content depends on. The superlative conditions from each abiotic factor will be applied to one set to compare to the control groupÆs data.

Data collection is insufficient at the moment; however, it is expected that algae with high lipid content will flourish upon increasing the light intensity and nutrient content. The data will be analyzed for the preeminent conditions from which algae can formulate optimal lipid production. In addition, the analysis will be used to determine appropriate usage of these algae for biofuel while acknowledging factors such as cost, availability, and effectiveness.

Researchers consider algae, with the potential to produce high levels of lipid efficiency, as a significant factor in biofuel as well as a promising part of the future.

NAME(s) **Kahla Reinhart**

PROJECT NUMBER **G26**

SCHOOL Avalon Triumvirate Acadamy

GRADE 5

TEACHER Amanda Gifford

PROJECT TITLE **Muddy Waters**

ABSTRACT

Erosion is a natural process that is complicated, yet easy to understand. 80%-90% of the worldÆs streams are eroded. Erosion can cause land loss, habitat loss, a higher river which can cause other dangerous problems. There are two main forces that can cause accelerated erosion: gravity and the characteristics of the river. The rocks at the bottom of a stream are round because of erosion. The streams and lakes are muddy after a rain storm because of erosion. Water is the most common cause of erosion because there is so much of it on Earth.

It was hypothesized that the straight stream will erode faster than curved streams.

The stream table was raised to simulate a stream on a hill. The stream table was filled with sand, and smoothed out so the sand was even in height. A stream was dug using a template; water was poured through a funnel at the top, and observed.

One common outcome was that erosion produces undermining of the stream bank, causing overhangs and banks to fall in. Water carried lots of sediment to cover the bottom of the bed and clog the drain hole.
Results showed that the river with two curves eroded the most. Common places for erosion on this stream were the start, the end, and on outside of the bends. Erosion for the straight steam was consistent throughout.

One way to repair erosion is gabion baskets: star like cases that hold the banks up. To prevent flooding, put logs and rocks along the banks, put up fences, or grow more trees to hold onto the soil.
The hypothesis was not actually tested, however it was determined that more erosion happens from streams with curves.

NAME(s) **Asa Richardson-Skinder**

PROJECT NUMBER **B22**

SCHOOL Main Street Middle School

GRADE 7

TEACHER Eli Rosenberg

PROJECT TITLE **Does Hand Sanitizer Really Kill 99.99% of Germs?**

ABSTRACT

I wanted to find out if hand sanitizer really kills the 99.9 percent of bacteria and germs that it claims that it will if you use it right. My hypothesis stated that I wanted to find out if hand sanitizer is as effective as is claims.

I used petri dishes to grow bacteria from volunteerÆs hands, before and after using hand sanitizer. I also made eight control plates to make sure that bacteria floating in from the air or possibly non-sterile petri dishes.Then I incubated the dishes for two weeks. I then measured the amount of bacteria using centimeter grid paper.

I found that hand sanitizer is highly effective. The amount of bacteria grown on a plate with sanitizer was even less than a control, which was not touched. The average percent coverage of a plate that had no sanitizer was 40.75 percent. It dropped to only six percent coverage on average after sanitizer use. On three out of eight test subjects, sanitizer killed all bacterial growth. On two subjects, no bacteria grew at all. On three, the sanitizer did not kill all of the bacteria. For the most part, hand sanitizer was effective when used correctly.

NAME(s) marcus roberge
PROJECT NUMBER P25
SCHOOL mater christi school
GRADE 8
TEACHER Mark Pendergrass
PROJECT TITLE home made snow

ABSTRACT

This project was designed to answer the following questions: does the type of snow maker effect the quality of the snow created? The hypothesis stated that the exterior mixer would create smaller snow than the interior mixer. Ski resorts use both types of snow machines to create the snow needed. This test involved the two types of snow makers. The first step that was needed was to build the snow makers. The next step was to set up the equipment and turn on the snow makers one at a time. Then lastly take the digital caliper and measure the snow flakes. The machines where left to run for awhile with a temperature under 22oF until enough snow was created to measure the snow flakes created. The snow was measured using a digital caliper set on 0.00mm.. The size of the snowflakes was recorded on the data table. The exterior mixer was left to run at 22oF while the interior mixer was run at 10oF. A few difficulties in the project were that the air compressor used was not fast enough to maintain the air pressure required for the project. Also, the water that was used had a small amount of salt because the water source was from a soft water system so that might have affected the neurlization of the water. The results of the experiment were that the interior mixer made smaller powder like snow. The average size flake as measured by the caliper produced by the exterior mixer was 2.62mm., while the average for the interior mixer was 1.02mm. The results contradict the original hypothesis.

NAME(s) Caitlin Roberts
PROJECT NUMBER B38
SCHOOL Windsor High School
GRADE 10
TEACHER Jennifer Townsend
PROJECT TITLE The affect of pH levels on blood glucose

ABSTRACT

The purpose of this experiment was to determine whether pH affects how quickly hypoglycemia is corrected. The hypothesis was lf a diabetic were to compare how three different glucose rich foods affect their blood glucose, then the food with the pH level closest to 2 would bring the blood glucose up the fastest. To test this hypothesis, I tested the pH levels of three of the most common liquids l use to correct hypoglycemia. Liquid glucose had a pH of 4, maple syrup had a pH of 3 and the juice had a pH of 6, so l thought maple syrup would work the best based on my hypothesis. Then, one at a time, I drank each liquid and monitored how they affected my blood glucose over the course of 45 minutes (15 minute intervals). The data was as follows; Juice B,G. was 110 mg/dl. to begin with, then 120, 153, and then down to 103; the maple syrup BG. was 103 mg/dL to begin with, then 103 again, 116 then 115; the liquid glucose BG. was 48 to begin with, then 78, 117, and 147. The conclusion was that the hypothesis was incorrect because the liquid with the lowest pH level didnÆt work the best.

NAME(s) **Zachary Rongo** PROJECT NUMBER **P26**

SCHOOL Saint Francis Xavier GRADE 7

TEACHER Mary Ellen Varhue

PROJECT TITLE **Bright Ideas**

ABSTRACT

○One night I was wondering, is there a light bulb that would heat my fish tank during the winter? This sparked my interest to experiment with different types of light bulbs. Do different types of light bulbs emit different temperatures? This research question leads to my hypothesis. I believe the LED light bulb will emit the most heat.
○I began my experiment by gathering a lamp, an incandescent bulb, a compact fluorescent bulb, and a light emitting diode bulb all of equivalent wattage. Using an infrared thermometer, I charted the temperature every minute for 10 minutes. This experiment was performed indoors and outdoors during the winter.
○My data shows the incandescent bulb rapidly increased and peaked at 195 degrees Fahrenheit. The CFL also had a rapid increase but peaked 30 degrees less than the incandescent bulb. The LED increased steadily with a maximum of 86 degrees after ten minutes. The results for the outdoor experiments duplicated the indoor experiment results except with lower temperatures.
○My experiment disproved my hypothesis. The LED bulb actually peaked with the lowest temperature. This experiment did answer my research question. However, I would like to investigate further with the incandescent bulb to see if it is capable of heating up my fish tank water.

NAME(s) **Emma Saucier** PROJECT NUMBER **P27**

SCHOOL Windsor High School GRADE 10

TEACHER Jennifer Townsend

PROJECT TITLE **Cell Phone Microscope**

ABSTRACT

A microscope is a valuable tool in the world of medicine. They are used to detect deadly disease that would otherwise go undiagnosed. The only problem is that they can be pricey, in a third world country that means access is limited. Most people in the world have a cell phone. They are used as a vitals line of communication between remote areas. With the combination of accessible materials and cellphones as lines of communication to a lab, this microscope is easily accessible to someone who doesnÆt have the money to buy a normal compound microscope. The materials used are widely accessible, as they are common industrial materials. If a product is not available it is interchangeable because all the materials used can be generalized to fit many areas of the world. The data collected showed that the one millimeter lens with no zoom produced the best quality image. In this picture there was definition of cells but they were not all individually defined. The other major finding was the relationship between lens size and the size specimen. This relationship is defined well when you look at muscle tissue with a three millimeter lens and then blood cells under the one millimeter lens. This shows that the ratio between sample size and lens is crucial to the quality of the image.
○

NAME(s) Alyssa Schlenter
PROJECT NUMBER B23
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **The Effects of Magnetism on Radish Plant Growth**

ABSTRACT

The purpose of this experiment was to determine how magnetism affects radish plant growth. It is hypothesized before the execution of the experiment that the plants grown with a ring magnet, a high source of magnetic force, will germinate faster than the other two pots of plants and will have taller average plant heights recorded within the 30 days of the data collection period.

○The control group of this experiment is the pot of radishes planted without a magnetic force, therefore being grown in standard plant conditions. The experimental group is the two pots of plants grown with magnets in the center, one with a bar magnet and the other with a large ring magnet. The dependent variable is the growth of the plants in regards to the plant height and time it takes each seed to germinate in the time frame that data was collected. The independent variable is the amount of magnetism that the three pots of radish plants are grown with.

○All of the data has been collected for the experiment up to date. The analysis of the results consisted of looking for any significant differences in the growth of plants in the three separate pots planted with different amounts of magnetic forces. The final results of this experiment can benefit others to know that plants grow faster when planted with magnets.

NAME(s) Jessica Selmer
PROJECT NUMBER P28
SCHOOL Weathersfield School
GRADE 8
TEACHER David E. Lambert

PROJECT TITLE **Rotation vs Stationary**

ABSTRACT

The problem IÆm studying is whether a rotating solar panel that is following the sun, outputs more voltage than a stationary solar panel that is always pointing in one direction. I chose it because it seemed interesting and I wanted to find out if it would help anything.

○Some background information that I gathered prior to forming my hypothesis is that in space scientists have satellites that are pointing at the sun gathering energy. I figured that the scientist has them pointing at the sun for a reason. I also looked had what a solar panel is in my research paper. A solar panel is a group of connected cells that can convert the rays of the sun into energy. I also looked up the definitions of things like watts and joule unit.

○My hypothesis is ôWill a rotating solar panel output more watts than a stationary solar panel or will the stationary panel output more.ö

○While doing my project I had a solar panel pointing south at an angle of 17 degrees, which is the potion that it needs to be for the winter time. Then I had one always pointing at the sun following it across the sky. I did this on a cloudy day and a sunny day from the time the sun went up to when the sun went the down. Then I used an ultra-violet light bulb. I had a solar panel pointing directly at the light bulb to simulate the rotating solar panel tracking the sun. Then I used a protractor to point the solar panel at each angle to simulate the stationary solar panel.

○ My principal observation and results was that the rotation solar panel does indeed output more voltage than the stationary solar panel and whether it is pointing at the sun or not makes a difference.

○My hypothesis was supported. It showed that tracking the sun with the solar panel is a better way to output voltage.

○ Some questions that arose during my project are do all kinds of solar panels react the same as the one I used or does it differ from each type. Also is there a way to direct the sunÆs rays into the solar panel instead of tracking the sun like using a reflector?

NAME(s) **Savana Senecal** PROJECT NUMBER **C19**

SCHOOL Saint Francis Xavier GRADE 7

TEACHER Mary Ellen Varhue

PROJECT TITLE **I Can See Clearly Now The Stain Is Gone**

ABSTRACT

○Throughout the history of washing clothes, one question seems to baffle even the most learned of launderer, which detergent works best? The purpose of this project was to discover if any difference existed in the common brands of detergent used on typical household stains. I hypothesized that if the cleaning power of the laundry detergent is related to the mess, then Dreft, requiring the most detergent for a load, would remove the stains the best. Six laundry detergents were selected; Tide, Gain, Wal-Mart, Dreft, Cheer, and All. Eighteen white t-shirt fabric measuring six by nine rectangles were stained with a one inch circle of lipstick, grass, chocolate, ketchup, and coffee. These stains were laid out to dry for one week. Three rectangle sheets were washed at a time using a single detergent with cold water in a Kenmore front loading washing machine. Each of the six laundry detergents were put into the washing machine according to the manufacturing instructions. The sheets were then observed to see how well the stains were removed. After close examination, Wal-Mart proved to remove the most stains, Gain the second most and All the least. This experiment shows that out of the six used, Wal-Mart would be the best detergent. To do this experiment again, one might use other detergents, different fabrics, different temperatures of water, and a load with no detergent. This research would help consumers get the best product for the least amount of money.

NAME(s) **Junior Serwili** PROJECT NUMBER **P29**

SCHOOL Saint Francis Xavier GRADE 7

TEACHER Mary Ellen Varhue

PROJECT TITLE **Rainbow Panels**

ABSTRACT

○Solar cells are devices that use a clean form of energy to benefit our planet. My project tested to see which color of light worked the best with a solar panel. My hypothesis was that violet light would work the best and that red light would do the worst.

The most crucial part of performing my experiment was building the right set up. I put the solar cell in a shoebox and attached a voltage meter through a hole. Then I placed a piece of cardboard (made to fit inside the box snugly) with a square hole in it, and placed the color filter on the hole. Then I placed it all in a significantly larger box with the light source, and then turned the light on over the color filters. The most important variable was the temperature of the place where I conducted my experiment and keeping it constant through my trials.

The result of my experiment was that yellow worked the best by an average .02V over the second best (orange) and green worked the worst by an average .06V over the second worst (violet). The reason this probably happened was because all solar panels are tuned to be sensitive to a certain wavelength. My project shows that matching the wavelength sensitivity of the solar panel to the light coming in is important. My project answered my question and met all my objectives.

NAME(s) Mehul Shah
PROJECT NUMBER P30
SCHOOL Frederick H. Tuttle Middle School
GRADE 8
TEACHER Greg Wolf

PROJECT TITLE **The Effect of Water Density on the Flotation of a Boat**

ABSTRACT

A boat made of steel floats, but a block of steel sinks. A boat that floats best can be determined using the following criteria- how far it floats out of the water, the stability, and when it sinks. This test is designed to determine the density of a boat that floats best in different water temperatures and concentrations of salt. A model boat made of clay was tested in fresh water and 3.5 percent salt water at different water temperatures. Glass beads were used as weights to alter the density of the boat while testing, and a centimeter ruler was used to measure how far it floats out of the water. During this experiment, first the density of water at different temperatures and salt concentrations was measured. Then the volume of the model boat was determined using an over-flow bucket and a graduated cylinder. Then, the density of the boat at which it sinks was determined by adding weights to the boat while it was in water. Finally, three boats with different densities were tested to compare how well they float in water at different temperatures in fresh water and 3.5 percent salt concentration water. The three boat densities chosen for the final test were 0.442g/ml, 0.651 g/ml, and 0.962 g/ml to represent two extreme densities and a density in between. The boat with a density of 0.651 g/ml was stable, did not sink and floated the best.

NAME(s) Zoe Shamis
PROJECT NUMBER B39
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Unconjugated Bilirubin in Pediatric Acute Lymphoblastic Leukemia Patients**

ABSTRACT

The purpose for this experiment is to determine whether children under treatment for Acute Lymphoblastic Leukemia consistently present elevated levels of unconjugated bilirubin and what the possible causes are. In this experiment, it is hypothesized that elevated unconjugated bilirubin is a prevalent side effect due to compounds in certain chemotherapy medications that do not allow the bilirubin to be fully excreted.
The control in this experiment is the normal levels of unconjugated bilirubin in healthy children who are unaffected by cancer or chemotherapy, which will use the standards doctors use when diagnosing high bilirubin levels. The dependent variable is the level of bilirubin and the independent variable is chemotherapy for ALL. Data will be collected using a survey for pediatric oncologists nationwide. This survey will inquire about how many patients they generally treat for ALL in a year, how many patients they see with elevated unconjugated bilirubin, and what they believe is the cause, along with other possible questions.
At this time, data collection is incomplete, but it is expected that elevated unconjugated bilirubin is a common side effect seen in children treated for ALL. The data will be analyzed to find the percentage of patients that exhibit elevated unconjugated bilirubin from each individual survey, then the total percentage of patients with elevated unconjugated bilirubin in the survey group. The believed causes of elevated unconjugated bilirubin provided by each doctor will also be examined for correlations and adherence to the hypothesis.

NAME(s) Teagan Shepherd, Matthew Wilson
PROJECT NUMBER Q12
SCHOOL Washington Junior High
GRADE 8
TEACHER Mrs. Shepherd
PROJECT TITLE Growing Greens

ABSTRACT

Growing greens was a wild experiment, the reason I did it was to see what colored light waves would grow lima beans the best. If you know how plants react to different light waves, you can incorporate those wavelengths into your garden, to produce a better harvest. How I did was I planted twenty-five lima beans in five different colored treat bags. I checked each bag after every thirteen days. After thirty-nine days we ended the data collection and averaged out the growth. We had 5 trials on each plant and the averages of each plants stem height are as follows: ClearÆs was 38.06mm, redÆs was 55.07mm, yellowÆs was 39mm, greenÆs was 36.9mm, and blues was 41.07. Our hypothesis was not supported by the data we had collected because the blue bags average at each check date height was 41.07mm while the red bagÆs average height was 55.07mm. Therefore, the blue bags did not grow the tallest, and the red bags did not grow the least amount, which does not support our hypothesis.

NAME(s) Beatrice Shlansky
PROJECT NUMBER G27
SCHOOL Mater Christi School
GRADE 7
TEACHER Mark Pendergrass
PROJECT TITLE It's in the Water

ABSTRACT

Given the concerns of agricultural and storm water run-off in Lake Champlain, this science fair project was intended to answer the following questions: Does pollution have an effect on plants? If so, does fertilizer add to the problem or the solution? It was hypothesized that if plants were watered with a 1% solution of polluted water that the growth of a plant would be reduced. The research completed found that pollution alters the pH of water which affects the aquatic life and plant life negatively. Research also showed that pollution did have effects on plants, and nitrates, present in fertilizer, can be a pollutant. The procedure involved growing Wisconsin Fast Plants under a timed full-spectrum light which would simulate a natural day. After five days with clean, unpolluted water, the plants were separated and watered for the next 11 days with either a solution of: (i) filtered water, (ii) filtered water with fertilizer, (iii) polluted water, or (iv) polluted water and fertilizer. There were two plants for each solution tested. For every solution used, the pH was tested to be in range of 6.5-8.5, the typical pH for waterways in America. The tester watered the plants every two days, and recorded the plants height and observations daily. In the end, the results showed that pollution affected the plants growth and fertilizer did help offset the effects of pollution. In the non-control groups, the test group of the fertilizer with polluted water group had a larger height than the polluted water group. The controls still performed better than the polluted water groups, but fertilizer in the polluted water helped aid the growth of the plants against pollution.

NAME(s) Ben Sievers
PROJECT NUMBER G28
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Comparing the difference in nutrient levels between large and clear lakes with small and m**

ABSTRACT

The purpose of this experiment was to show the difference in nutrient levels between smaller, shallower and murkier lakes (Eutrophic) and larger, deeper and much clearer water lakes (Oligotrophic). I will collect water samples from 2 larger, deeper and clear lakes, Lake Carmi and Lake Willoughby. Also I will collect water samples from 2 smaller, shallower and murkier lakes, Lake Elmore and Shelburne Pond. Then with these water samples I will perform three tests to show the nutrient levels in each water sample. The three nutrient levels IÆll be testing are the Ph, Phosphorus, and the Nitrogen level. Before all of the testing, with prior knowledge it is hypothesized that the shallower and murkier lakes will have higher nutrient levels than the larger and clearer lakes.

○For a control group, I will be performing the same tests on regular tap water to compare the results of each of the lake to drinking water. The experimental groups will include the results from each of the lakes that I collect water from. The use of tap water as a control group helps to understand the real difference between the results and to see how much the lake water differs from tap water.

○Data collection is still in progress at the moment however as I stated before I believe that after all the testing is complete, I will have data that shows that the Oligotrophic lakes will be richer in nutrients than the Eutrophic lakes.

NAME(s) Nathalie Simon
PROJECT NUMBER C20
SCHOOL Saint Francis Xavier
GRADE 8
TEACHER Mary Ellen Varhue

PROJECT TITLE **Number 1 Water Filter**

ABSTRACT

○I did this project because I wanted to discover which particle size of sand and gravel will work best for filtering. Knowing the best material size to use in a filter could help clearing out dirt and debris from the water. In a real filter where they clean the water for the tap they have many stages and ways of cleaning the water, the sand and gravel filter is actually one of them.

I wanted to find out if particle size affected filtration, so my hypothesis was that the fine sand would filter the best because it was the smallest and would let less debris through.

My procedure was that I took four two liter bottles and cut the top off. I filled two with gravel and the others with sand. There were large and small sizes of gravel and fine and coarse sizes of sand.

The results of my experiment were that small materials filtered the best, I ranked each bottle on their turbidity from a ranking of 1 through 10. As I was watching the filtration process the smaller particles were having better results than the larger ones, but I did notice that if the particles were too small they would filter right through with the water as well.

This knowledge is useful because it shows that the performance of sand and gravel filters can be changed by simply changing the particle size. I believe that I met my objectives because I found out what particle size filters the best and why.

NAME(s) **Jacob Smith** PROJECT NUMBER **B24**

SCHOOL South Burlington High School GRADE **10**

TEACHER Curtis Belton

PROJECT TITLE **What does Centrifugal Force do to Plants?**

ABSTRACT

The purpose of my project is to determine what centrifugal force does to plants. Fast plants are a special type of plant that grows completely from a seed in just a couple of weeks. This way you can get measurable results every couple of days. In this controlled experiment it is hypothesized that the experimental plants will grow larger quicker and grow more flowers and seed pods.

The control group consists of four plants, each grow separately from one another. The experimental group is grow and treated the same as the control group except for the experimental have an independent variable added to them. The independent variable is centrifugal force. I am also measuring for various dependent variables. These are the height, leaves, flowers, number of seed pods, and number of seeds in each pod.

My data collection is not finished yet, but it is expected that the experimental plants will end up growing taller by the end. When I am finished I will compare my control groupÆs results to my experimental group to see exactly what effect the centrifugal force did.

NAME(s) **Sara Spencer** PROJECT NUMBER **P31**

SCHOOL Weathersfield School GRADE **8**

TEACHER David E. Lambert

PROJECT TITLE **Drag vs. Shape of Helmet**

ABSTRACT

In my science fair experiment I tried to find out if I could design the most effective aerodynamic helmet. I wanted to find this out because humans are not dummies and we move our heads while riding a bike. I was trying to see if I could find a helmet more effective than the Specialized TT2 helmet, which at the moment is the most aerodynamic helmet in the biking world.

Before forming my hypothesis I found out that some people, when wearing a aero helmet bike riding, would turn their heads and get blown off course and it would slow them down. I also found a lot of aerodynamic shapes that could be used for differently designed helmets, such as a teardrop or an egg shape. Many animals also have to have aerodynamics, such as a goose who, when flying, needs aerodynamics so they can get to their destination as fast as possible, you never know whether it might be a matter of life or death. In a bike riderÆs case, if he/she turns their head they can get blown off course and get injured. I found out that the relative wind, or the wind that you feel as you are moving, causes this to happen.

I thought that the helmet model of an egg shape, a combination between a teardrop and a sphere shape, would be the most effective aerodynamic shape that you could get for a time trial road bike.

In my experiment I had to design three different helmets. I designed and made a teardrop shaped helmet, an egg shaped helmet, and a helmet that was a replica of the Specialized TT2 helmet, the most aerodynamic helmet out there at the moment. After I designed and made all the helmets I put them on top of a dolls head, attached to a ôcarö in a wind tunnel. I would turn the fan on in the wind tunnel and pull the head back to eight NewtonÆs,

NAME(s) Samantha St. Marie
PROJECT NUMBER M04
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **Tension Controls the Game**

ABSTRACT

The question that was accessed in this experiment asked if the velocity of a tennis ball would be affected by the tension of a tennis racketÆs strings. Based on research I was able to predict and prove that if a tennis racketÆs strings are tightened around 50 pounds then the tennis ball that contacts with the racket will reach a higher velocity because the looser string tension is able to store more energy and propel a ball faster than a string tension of 70 pounds. In order to demonstrate and prove this theory I performed an experiment that required an amateur tennis player to hit tennis balls with the same swing motion and tennis racket, but change the string tension. Three string tensions were tested at 56 pounds, 58 pounds, and 60 pounds. After 24 trials, 8 for each tension, it was proven that 56 pounds produced the highest velocity with an average speed of 43.75 mph, while the 58 pounds produced an average of 37.75 mph. Finally the 60 pound string tension produced an average speed of 33 mph. These results prove my hypothesis correct, looser string tensions do propel tennis balls faster than tighter strings due to the looser tensionÆs ability to store more energy in its contact with the ball and transfer that energy to the ball, increasing its speed. These findings are extremely important for amateur and professional tennis players alike who want to improve their tennis shots because tension really does control the game.

NAME(s) Hannah St.Denis
PROJECT NUMBER S20
SCHOOL Randolph home school group
GRADE
TEACHER Gina Sweet

PROJECT TITLE **Don't Judge a Book by it's Cover**

ABSTRACT

ABSTRACT

My project tested the theory that more people judge a book based on its cover rather than the synopsis.

My hypothesis is that more people would chose a book based on the contents of the cover instead of what's on the back of the book.

I tested my hypothesis by asking twenty-nine people that I know which book they would most likely read out of the books displayed on the table and wrote down their answers.

My experiments result partly supported my hypothesis. More people did chose the books displaying the picture on the cover, but the numbers were too close to count as the actual over all result.

If I had more time I would probably get more people to participate in my experiment to get a more accurate result for my experiment.

NAME(s) **Liam Strobeck**

PROJECT NUMBER **C21**

SCHOOL The Renaissance School

GRADE 6

TEACHER Caryn Shield

PROJECT TITLE **How do emotions affect water crystallization?**

ABSTRACT

The topic of my project is how emotions affect water crystallization and water freezing. My topic explores what happens to freezing water if you write different emotions on a jar of water, such as hate or love. My hypothesis is that the bad emotion (such as hate or stupid) will make the frozen water's pattern look bad and the good emotion (such as love or nice) will make a clearer pattern.

To perform the experiment, I put the same amount of water from the same source in two similar sized jars. I added a strip of paper on one of the jars that says love, and a strip of paper on the other jar that said hate. Then, I froze the water under the same conditions. I used the microscope to look at the different water crystals and freezing patterns, and how the water froze in the jars.

The data did support my hypothesis because the hate jar broke while freezing and the air bubbles were moving faster and rushing through. For the love jar while freezing it did not crack and it had slower moving air bubbles. My conclusion is that emotions affected water freezing, and the emotions might also have a powerful healing affect on polluted water.

NAME(s) **Katie Sweet**

PROJECT NUMBER **S21**

SCHOOL Randolph Homeschool Co-Op

GRADE 9

TEACHER Gina Sweet

PROJECT TITLE **Brain and Eyes**

ABSTRACT

My hypothesis is that we will respond to the word that we read rather than the color that the word is printed in. If the word is in a different color, the brain will have to transfer the information so that we can figure out what the word is. The left side of our brain does wording thoughts, and our right side does creativity with colors and arts. Since our whole brain works together, our brain tries to put those two together; this causes confusion for our mind to figure out what the words are. My procedure was as follows. I asked each person to read the words that they saw on the sheet. This sheet only had words that were the same as the color. I did the same thing again except this time, with words with the colors mixed up. Once they did that test, I gave them a picture and told them to name all the colors that they saw in that picture. After they did that, I gave them the test again. I found out that having the picture before doing the test again made it take shorter time than before the picture. Before the picture, the adultsÆ time was 110 seconds; after the picture was 80 seconds. For the students, it made a no difference. Before the picture was 55 seconds, after the picture was around 57 seconds. It helped the adults to have the picture more than the students.

NAME(s) Luke Sweet
PROJECT NUMBER P32
SCHOOL Randolph Homeschool
GRADE 10
TEACHER Gina Sweet
PROJECT TITLE **Wheels in the Water**

ABSTRACT

Will the height of the water, falling on a water wheel, have any affect on the electrical energy produced? My hypothesis was that the farther the water falls, the faster the wheel will turn and the more electricity it will produce.
To test my hypothesis, I made a water-proof wooden tank. I made a waterwheel with Styrofoam and wood and a flume for the water to fall on the wheel. I attached a dowel in the middle of the wheel and used gears to attach the turning dowel to a DC motor. I drilled a hole in the top of the tank and I inserted a large dowel with height measurements. I used PVC pipe to raise the height of the flume. To make the water come from the tank to the flume, I used a pump with plastic tubing. I used a multi-meter connected to the DC motor to measure the electric current in volts.

At the lowest height the voltage was 0.060 volts; the second height, 0.073 volts; the third height, 0.072 volts; and the fourth height, 0.073 volts. At the fifth height the voltage went down to 0.066 volts. My results indicate that my hypothesis was not correct for my experiment. The voltage increased at the second height. After that, it stayed about the same until the fifth height. One of the problems was probably that I was using a pump that was not strong enough for the height of the fifth trial, so less water was being put into the flume. To correct this error, I should raise the water and pump position each time I raise the flume. It would be better to do this experiment with an actual waterwheel at a river.

NAME(s) Kristen Switzer
PROJECT NUMBER C22
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar
PROJECT TITLE **The Flammability of Paint**

ABSTRACT

The purpose of this experiment was to find out if adding baking soda or borax to paint could change the time it took to ignite with a flame near it. To conduct this experiment, I carefully measured out 5, 10, 15, and 20 gram quantities of each additive using a scale. I mixed each amount with 50 milliliters of paint and applied it onto pieces of wood. After letting them dry, I put a flame under each piece of wood and timed how long it took them to ignite. I found out the paint mixed with the borax consistently took longer to ignite than the paint mixed with the baking soda. The average time of ignition for the baking soda was 24.8 seconds, and the borax was about 28.9 seconds. My hypothesis was correct because when either the baking soda or the borax was added to the paint, it reduced its time of ignition. The paint with no additives took 14.8 seconds to ignite, and when just 5 grams of either additive was mixed in, the time was longer. If I were to conduct another experiment based on this project, I would see if different woods or different types of paint would change my results. This project has information in it that can be helpful to many people. Adding these ingredients into the paint makes it more resistant to catching on fire, which could potentially prevent house fires and save lives.

NAME(s) Dilaram Temirova

PROJECT NUMBER B40

SCHOOL Frederick H. Tuttle Middle School

GRADE 7

TEACHER

PROJECT TITLE **Is lung capacity different for athletes or nonathletes?**

ABSTRACT

○ My topic is "The lung capacity difference for athletes and/or non-athletes." This was sort of a hard topic because you need to find out how many people you should do and if the trials are right and equal. Also some other things that were quite hard was that I had to test 40 people total, and to find most of the people was pretty hard. But putting all the trials on one data table was also a challenge that I had to face. Over-all I came to an end of all the testing.

I also did a hypothesis about this topic and that was; the lung capacity is better for athletes because as When the Athletic person blows in the balloon, the balloon will be bigger, when the nonathletic person blows into it is going to be smaller. The bigger the balloons size, then when they get to an older age they will get healthier. In the beginning of the whole science fair of picking the problem I picked "The lung capacity difference for athletes or non-athletes.ÆÆ After that day I had to find background information about my topic. Some things I searched up were æælung capacity, " athletes, non-athletes and anything to reduce the bad lung capacity if you are not an athlete. Then came the materials and procedures section that I had to figure out.

Now to show the materials and procedures that I wrote and that I needed;

1) 20 athletes, for the controlled trial (Same age)
2) 20 non-athletes, for the experimental trials (same age)
3) Some kind of experiment, to get the trial tired. (IÆm making it be mountains climbers)
4) A timer, to time the exercising amount and other times during the experiments. (30 seconds)
5) A cm and inch ruler to measure the diameter of the balloons size.
6) 1 to 2 bags of balloons, for the people to blow into, also for the balloons

NAME(s) Eliza Thomas

PROJECT NUMBER B48

SCHOOL Mater Christi

GRADE 8

TEACHER Mark Pendergrass

PROJECT TITLE **Grain For Thought**

ABSTRACT

The question was, will a formulated grain, based on horse preference of basic ingredients, be favored over commercial mixtures by horses? This projectÆs hypothesis was, if horses are given a choice between a grain mixture tailored to their likings and commercial grain mixtures, they will choose the tailored grain mixture more often. In the process of researching information on this project, it was learned that there is a high probability that older horses have more sensitive teeth and crunchier grains can cause pain. This can make them dislike a certain mixture affecting the results. In the first test, eight horses were given four buckets of basic grain ingredients for one minute. These results were analyzed and a homemade grain was mixed, based on the results of this first test. The second test consisted of giving each horse four buckets of grain mixtures, one of these was the homemade grain and the other three were commercially mixed grains. Measurements were based on how long the horses ate each grain mixture. When analyzing the data, the results show that the preferred grain mixture was the homemade formulated one. The hypothesis proved to be correct. If a grain is made by analyzing what ingredients are most liked, it will also be favored by the horse.

NAME(s) Baylee Thompson
PROJECT NUMBER C23
SCHOOL Rutland High School
GRADE 11
TEACHER Ann Marie Mahar

PROJECT TITLE **Taste The Dye**

ABSTRACT

The purpose of this experiment was to determine which food dye, Red 40, Yellow 5, or Yellow 6, affected the human body the least. To do this, with those dyes, I questioned which artificially colored candy, of Skittles and M&MÆs, will travel through the body the fastest and which one would affect it the least. After doing research, I made my hypothesis. My hypothesis stated: If artificial colored candy food dye, Yellow 5, has the smallest maximum absorbance rate, then it will travel through the body the fastest, resulting in the largest Rf value. In order to back up my hypothesis, my experiment consisted of me conducting a chromatography lab. My procedure consisted of household safe instructions that I could do at home. I got Skittles and M&MÆs and then removed the dye from the red, yellow, and orange candies with water. Next I transferred the dye to coffee filter paper. I wrapped the top of the coffee filter paper around a pencil and a small amount of the paper was exposed to the solution of salt and water. When the dyes traveled up the paper by capillary action and got close to the top, I took the paper out of the solution and calculated the Rf values. In all three trails Yellow 5 (yellow tint) had the largest Rf value. This proved that since Yellow 5 has the smallest maximum absorbance rate and the greatest Rf value, products with Yellow 5 will affect the body the least because they travel through the body the fastest.

NAME(s) Adam Tobey
PROJECT NUMBER B25
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **Effect of Storage Method on Coffee Freshness**

ABSTRACT

The purpose of this experiment is to find the most optimal storage method for coffee beans that is accessible to everyday use. A University of Udine, Italy manuscript details the testing of coffee freshness for shelf life, and provides the basis in the design of my experiment. The hypothesis is that cooler, more air-tight storage methods will preserve the most freshness.

There is no control group, as all of the methods will be tested against each other in terms of effectiveness. The dependent variable is the coffee freshness (amount degassed), and the independent variable is the storage method. Degassing of the coffee beans will be measured using water displacement, putting the coffee beans in a container connected to a narrow graduated tube filled with water on both sides of a bend in the bottom so that gas emitted by the coffee removes the water level parity by a measurable amount.

Data collection has not yet begun. The data will by analyzed through direct comparison of the degassing amount over time, crowning winner whichever storage method kept the coffee degassing for the longest, in terms of days, testing for about five minutes each day.

A conclusive result from this experiment could help any lovers of coffee to enjoy the freshest cup they can.

NAME(s) Rebecca Towne

PROJECT NUMBER B41

SCHOOL Windsor High School

GRADE 12

TEACHER Jennifer Townsend

PROJECT TITLE **The effect of age, years spent in music, and dissonance on the ability to hear high freque**

ABSTRACT

As I am a musician, and plan to continue being such for a long time, the obvious fear I have is prematurely losing my hearing due to time spent in bands and choirs. The purpose of this experiment was to test whether a personÆs age, or the time they have spent in music has a greater effect on their ability to hear high pitch frequencies, and furthermore, to see if a person cannot hear two pitches separately, if the pitches are played together to create dissonance, if the person can hear the pitches because of the dissonance. My hypothesis was that age would have a greater effect on a personÆs ability to hear high pitch frequencies, and that if two notes that the person cannot hear when played separately are played together, the person will be able to hear the pitches because of the dissonance created by the two.

○To test the hypothesis, I asked for multiple volunteers from around the high school, ages ranging from five to sixty-nine. With each volunteer, I played a series of high pitches, increasing in pitch each time, until the person could no longer hear the pitch. Once the first pitch was found that the person could not hear, I played one pitch higher by itself, then played the two pitches together and asked if the person could hear the pitches while played together.

○I found that the personÆs age had a much greater effect on the personÆs ability to hear the pitches, and that as the personÆs age went up, the highest pitch they could hear went down. I found that the vast majority of people could not hear the high pitches when played together, although a handful of test subjects could hear the pitches, because of the dissonance.

○From this experiment, I concluded that a personÆs age has a strong impact on their ability to hear high frequency pitches, and that the time a person has spent in music shows no clear pattern of effecting a personÆs ability to hear the pitches. I also concluded that most people will not be able to hear the dissonance created by two pitches that they cannot hear separately.

NAME(s) Andy Tuttle

PROJECT NUMBER B42

SCHOOL South Burlington High School

GRADE 10

TEACHER Curtis Belton

PROJECT TITLE **How the Arch of the Foot Affects Balance**

ABSTRACT

The purpose of this experiment was to see what measure of the arch of oneÆs foot is best suited for balance. The hypothesis for this experiment was that the closer to the mean an individualÆs arch is the more balance they will have.

If an individual chose to participate in this study, then they would have been subject to two tests. The first test is called the ôFeiss Lineö test. This test is administered to determine the measure of the individualÆs arch. This test consists of measuring the distance from the ground floor to the navicular tubercle on the individualÆs foot. The second test that would have been performed is the balance test. In this test, the individual puts his/her arms over his/her chest, and attempts to stand still on the foot that had just endured the ôFeiss Lineö test while they lift their other foot off the ground. This position is held for 45 seconds. If the individual makes any major movements to retain balance, the time is stopped and recorded.

At this point, data collection is not complete. However, from the individuals that have been tested, it seems that no correlation between the arch of the foot and balance exists at all. At the end of experimentation, all numbers will be collected to see if a correlation occurs between the arch and balance.

NAME(s) Taylor Tyminski
PROJECT NUMBER S22
SCHOOL Windsor High School
GRADE 12
TEACHER Jennifer Townsend

PROJECT TITLE **Beauty is in the eye of the beholder**

ABSTRACT

My project was about how proportion and symmetry are a big factor in what people find attractive in faces today. What I did was I went on the computer and started doing some research. I found a website called science buddies. On that site it had a bunch of different things that you could use for science projects. Since I had the idea to see how symmetry and proportion are a factor in attraction to faces I looked on science buddies to see if they had anything that I could use. Turns out they had this thing on there site that would make composite faces which is a face that is perfectly proportional and symmetrical faces. So what I did was I made a series of faces that I would have multiple people look at and tell me which face out of all the groups that I made which one looked the best. After having all the people look at al the faces that I made I made charts on excel and put the groups together by female answers, male answers and as a whole and overwhelmingly in 5 out of the 6 groups the composite faces won over the normal looking faces which just goes to show that people really do look for symmetry and proportion in faces.

NAME(s) Christopher Ubert
PROJECT NUMBER G29
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **The Effect of pH on the Rate at Which Oleophilic Bacteria Consume Oil**

ABSTRACT

The purpose of this experiment was to determine how pH affects the consumption of oil by oleophilic bacteria and how this consumption affects the pH. In this experiment it is hypothesized that as the water pH moves away from 7, the consumption of the oil by the bacteria will slow.
There are two different testing groups in this experiment. One of the groups is ocean water with a pH changed to the desired pH. The other group is the same as the other group, except a dispersant will be added to the water. The dependent variable is the consumption of oil and the health of the bacteria. The independent variable is the pH of the water. Prior to the experimentation, the pH changes will be set, using a pH probe. The amount of oil will be measured throughout the experiment. After the testing, the water will be tested for a change in pH.
Data collection is incomplete at the moment; however, it is expected that the dispersant will have a positive effect on the bacteriaÆs consumption of oil. The data will initially be analyzed to discover any significant changes in pH from pre-experimentation to post-experimentation.
New discoveries about bioremediation can help us learn more about the changes that can take place in the process and what will promote a speedy recovery of the ocean system.

NAME(s) **Dan Wagner**

PROJECT NUMBER **G30**

SCHOOL Mater Christi School

GRADE **8**

TEACHER

PROJECT TITLE **Brighter than a star**

ABSTRACT

The question for this project was, ôDoes population affect star gazing?ö. The hypothesis for the project was that population (through light pollution) has a direct effect on stargazing. The research for this project showed that the positioning in the sky and the time of night was very crucial for the data to be collected accurately. There was only a small window of time in which one could perform the necessary testing. A stand was created and set up that blocked out all but one 2.5 X 3.75 inch rectangle through which the tester looked and counted the stars. The tester tested two constellations. The stand was lined up with OrionÆs Belt and the northwest corner of the Big Dipper, and the tester was 14 inches away from the device at all times during the testing. A star chart was used to find the locations of the two constellations in the night sky during that specific date and time. The tester looked at the stars, counted them twice (to check for any mistakes or miscalculations that might have occurred), and then recorded the data in the data table on the clipboard held by the tester. The data analysis showed that the hypothesis was correct in theorizing that population (through light pollution) has a direct correlation to the number of stars that are seen during stargazing.

NAME(s) **Phoebe Weller**

PROJECT NUMBER **C24**

SCHOOL Mater Christi School

GRADE **6**

TEACHER Mark Pendergrass

PROJECT TITLE **From Chemicals To Colors**

ABSTRACT

If you put a pine cone coated with unknown chemicals into a fire, will you be able to identify the chemicals on the pine cone by examining the flames' spectrum lines. The spectrum lines that were recorded in this experiment will be compared to chemicals that could possibly be on a coated fire pine cone. The hypothesis was that you would be able to identify the chemicals. During the experiment many new terms were learned. A few being: spectrum, spectroscope, and wavelength. Spectrum is the range of wavelengths that electromagnetic energy emits. A spectroscope is used to measure the spectrum lines. Wavelength is the distance between a peak and a crest. The setup for this experiment included a spectroscope, a camera, chemicals, a propane torch, and a fireplace. First, chemicals were placed on a spoon in the fireplace. The propane torch was used to light the chemicals on fire. The spectroscope was put up against the camera to be able to read it more easily. The spectrum lines were recorded in the data table. The results for this experiment were that if you put a pine cone coated with unknown chemicals into a fire, you would be able to identify the chemicals by their spectrum lines. Therefore, the hypothesis was correct.

NAME(s) Brooke Westcott
PROJECT NUMBER C25
SCHOOL Rutland High School
GRADE 11
TEACHER Dawn Adams
PROJECT TITLE **Waterproof Mascara**

ABSTRACT

In this experiment, a test was conducted to see if waterproof mascara is truly waterproof. The hypothesis was if mascara is truly waterproof, then it will not streak, because by definition waterproof is impervious to water. To test this theory, false eyelashes were glued to 6 canvases and a heavy dose of mascara was added to each lash. After waiting 24 hours, I used water and cotton balls to streak the mascara down all 6 canvases. Once the experiment was complete, it was known that none of the waterproof mascaras were waterproof. The Rimmel mascara was not waterproof at all. It had a very long and dark smudge. The N.Y.C mascara had the same results as the Rimmel did. The Maybelline mascara did not have a long streak but had a very dark smudge. The LÆOreal mascara had a long streak but the smudge was very faint in color. The last waterproof mascara tested, CoverGirl, had no streak and a really faint smudge. The very last mascara tested was Avon, which was not waterproof, was the control in the experiment and had an extremely long streak and dark smudge, like expected. All of the companies made false claims when they said their mascaras were waterproof, when in fact they were only water resistant.

NAME(s) Owen Whitney, Shane O'Brien
PROJECT NUMBER GP06
SCHOOL Christ the King
GRADE 7
TEACHER Mrs. Vidula Srivastava
PROJECT TITLE **Soda VS Teeth**

ABSTRACT

We tested the effects of soda on teeth. We did this experiment because the corrosive effect of soda on teeth is a growing problem in the United States. One case of tooth decay, which is known mainly in the mountain regions where there is little or no dental care, is called Mountain Dew Mouth.

The purpose of our experiment was to one: show that soda changes the appearance of peopleÆs teeth, and two: to see the acidic levels of our saliva after drinking different kinds of soda. We tested Coca Cola, Diet Coke, Mountain Dew, Root Beer, Sprite, Seltzer, and water as our control.

We went about doing the first part of our experiment by putting teeth into soda and looking at them to see if there was a measurable change. During the second part of our experiment we drank cups of soda and spit on litmus paper to see the acid levels in our saliva.

When the first test was done we looked at the teeth and we could identify a large difference in the teethÆs appearance. In the second test, we found that the acid level in our saliva steadily rose for several minutes after drinking many of the different kinds of soda tested.

NAME(s) Anna Wulfson
PROJECT NUMBER B26
SCHOOL South Burlington High School
GRADE 10
TEACHER Curtis Belton

PROJECT TITLE **The Effects of different types of washing and drying methods on the cleanliness of laundry**

ABSTRACT

The experiment conducted was done to determine which washing and drying methods produced the cleanest laundry. Two separate washes were done in the same way. The outcomes of my experiment were not far from predicted-which was that a hot cleaning environment produced cleaner laundry.

After the experiment ended, the results showed that clothing washed in hot water reduced bacteria significantly more than cold water wash. There was little to no microorganisms grown on the shirts that were washed in hot water and dried inside without a drier or UV light. The shirts that were also washed in hot water and put in the drier showed very similar results to those just washed in hot water with no particular drying method. When washed in cold water and dried inside hanging, much more bacteria was produced.

The hot water and hot dryer made a difference for whether microorganisms showed up when swabbed on the agar plates. The shirts that went through either a hot wash or hot dry the plate showed minimal to no sign of microorganisms. The shirts from subject #2, when swabbed, showed that more bacteria was present than that found on the shirts of subject #1. The results were not far from the hypotheses but if this test was done again there would always be improvements to have more accurate results. Based on the results from the experiment, hot water and drying in a hot dryer seems to be the most successful way of producing the cleanest laundry.

NAME(s) Rebecca Youmans
PROJECT NUMBER S23
SCHOOL Randolph Homeschool
GRADE 11
TEACHER Gina Sweet

PROJECT TITLE **Depression and Artistic Expression**

ABSTRACT

In 1988, art therapists Linda Gantt and Carmello Tebone published the Formal Elements Art Therapy Scale, which would serve as a rating manual when scoring patientsÆ artwork. Using this manual, I designed an experiment to answer the following question: does depression affect a personÆs level of creativity, and would that person be more or less creative?

○My hypothesis was that people with depression would show a lack of or limited creative energy. I tested my hypothesis on a group of people of varying ages. I gave each subject a blank piece of paper and a set of markers, and instructed them to draw a person picking an apple from a tree. When the group finished their drawings, I handed out the depression tests and asked them to answer the questions as honestly as possible. (This was a blind study.) After the group completed their tests, I scored them according to the instructions, rated the drawings using the art therapy scale, then compared the test scores to the scores on the drawings.

○My results were that people with low scores on the depression test (0-5, or no to minor symptoms) tended to have a high score on their drawings (prominence of color, excessive amount of energy, etc.). In contrast, subjects who had high scores on the depression test (15+, moderate-severe symptoms) had scored low on their drawings (minimal color, lack of energy, etc.). These results seemed to prove my hypothesis: creativity is negatively affected by depression. However, certain variables may have affected the outcome of my experiment, and in future attempts I plan to eradicate these variables to obtain more accurate results.

NAME(s) **Sophia Moore**

SCHOOL Christ the King Rutland

TEACHER

PROJECT NUMBER **C26**

GRADE

PROJECT TITLE **Water for Life**

ABSTRACT

Many developing countries struggle with efficient and economical ways to treat available water for potability with minimal investment.

I investigated water treatment methods to learn which worked best to clean either suspended solids or dissolved contaminants in water. Effective treatment criteria considered included sufficient rate of production and reliable treatment. Artificial dirty water, representing suspended solids like turbidity, was prepared by mixing 3.5 grams of cinnamon per liter of water. Cinnamon was used because it behaves like dirt due to its similar grain size. Salty water, representing water with dissolved contaminants, was prepared by dissolving 3.5 grams of salt per 100 mL of water, a similar concentration to sea water.

Suspended solids water samples and dissolved contaminants water samples were each treated using filtration, distillation, condensation, Pasteurization, and capillary action. The filtration method used a filter column with gravel, moist sand and activated carbon over a filter paper cone placed above a collector cup. 100mL of sample water was poured through the assembly to drain through.

Distillation used 100 mL of steaming sample water below an ice filled plastic cone with a second collector cup suspended below the cone to collect the treated water.

Condensation boiled the 100 mL water samples in a covered pot. Periodically the condensed water was collected from the lid. Pasteurization used sunlight to treat the 100 mL samples of water. Capillary action used a cup containing 100 mL of sample water situated higher than a second collector cup into which the treated water was drawn using various materials. Start/finish times and measurements of the amount of treated water were recorded. Treated water amounts were scored using a graduated value chart, then evaporated and weighed.

Filtration treated water with suspended solids most effectively, while capillary action treated water with dissolved contaminants best.